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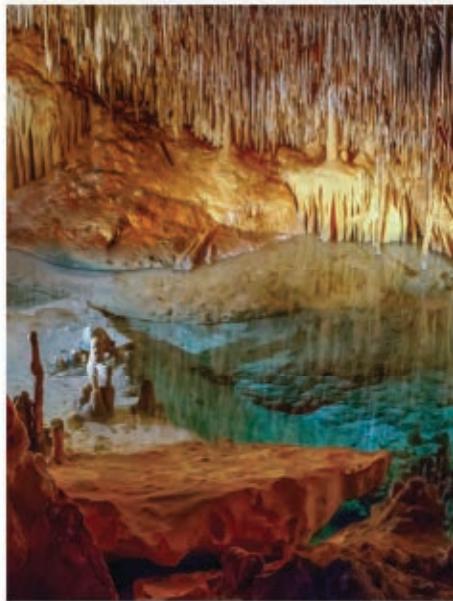
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OF THE PYRAMIDS?

THE SPIRITUAL ROOTS OF  
MODERN FEMINISM

RAPID GROWTH  
OF CAVES

ARE LIZARDS AND SNAKES RELATED?

OUT OF BABEL—NOT AFRICA:  
GENETIC EVIDENCE FOR HUMAN ORIGINS



# JOURNAL OF CREATION

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COVER: Speleothems inside a cave

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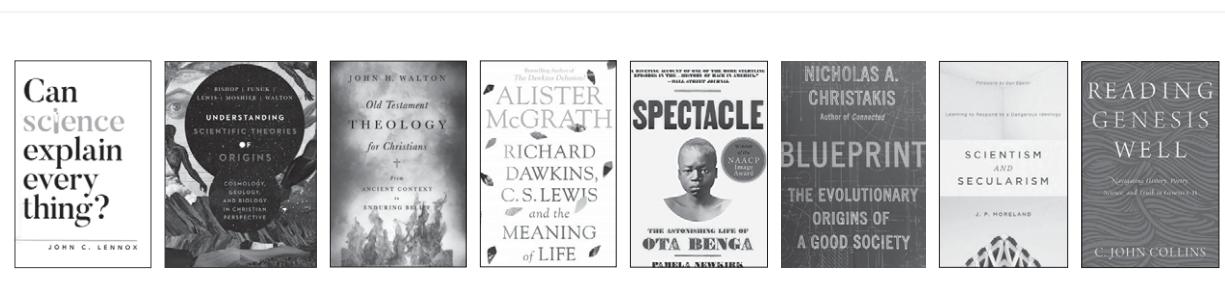
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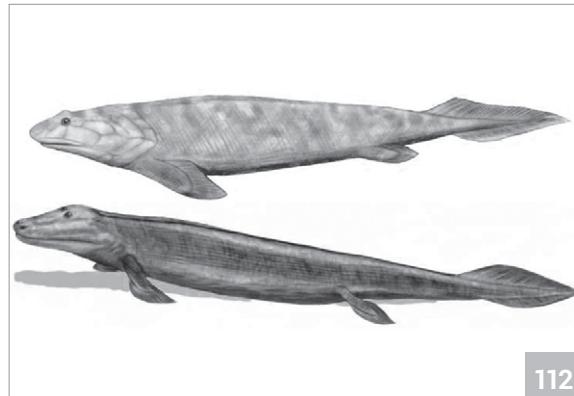
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# Complex water gap features—Krichauff Range, Northern Territory, Australia

Ron Neller

The term water gap, or transverse drainage, refers to a river that cuts through a mountain range as though it was not there. Although they are often pictured as narrow gorges, they are in essence a pass through a mountain ridge cut by a river and through which a river still flows. Frequently cited examples of such features include the Grand Canyon,<sup>1</sup> Hells Canyon in Oregon,<sup>2</sup> Himalayan rivers such as the Arun River of Nepal,<sup>3</sup> ranges across north and north-east Iraq,<sup>4</sup> and the Finke and Todd Rivers in Northern Territory, Australia.<sup>5,6</sup> This short paper outlines unusual water gap features in the Krichauff Range in central Australia that need further research.

## Current water gap thinking

There has been minimal geomorphic and geologic research on the origin of water gaps. Within the secular earth science literature, rivers that produce these landscapes have been primarily classified as either antecedent or superimposed rivers, or a combination of both (anteposition).<sup>7</sup> Antecedent rivers are those believed to be the older component of the landscape, maintaining a course that precedes the emergence of the rising terrain. In this case the rate of river erosion exceeds that of the rate of uplift of the land. On the other hand, superimposed rivers are those that erode down from a higher surface but

retain their course regardless of the different strata they encounter.

In addition to these two arguments, a more recent article<sup>8</sup> outlined a criteria-based methodology for determining the mechanism of water gap development, and strongly promoted two other processes. These include river piracy, when a river captures part of another river's catchment through headwater erosion, and overflow, when a lake breaches surrounding terrain and creates a new river.

Given that current classifications are based on interpretations of past landscapes and events, which are no longer evident or occurring, distinguishing the processes believed to form water gaps or their features is fraught with uncertainty—not the least of which is the lack of physical evidence that would suggest one process over another. As one author<sup>7</sup> notes: “In theory the concepts are quite simple but in practice it is often difficult to distinguish superimposition from antecedence”, and he warns of the danger of “inventing surfaces that never existed”.

## Water gap channel patterns

Water gap valleys often wind irregularly, though on occasion take on a more systematic spiral course (becoming highly sinuous). While water gaps give passage to rivers, they at the same time often constrain them. This is frequently recognized in research papers using words such as ‘maintain’ and ‘imposed’. Indeed, as just outlined, most water gap publications argue that the constrained river meanders are historic features: a component of a palaeovalley. This is regardless of whether the water gap was classified as antecedent, superimposed, river piracy, or overflow in origin.

Because water gaps largely constrain rivers flowing through them, they rarely exhibit elongation of their river axis, significant lateral erosion,

migration of meander loops, or cutoff events that are more classically associated with meandering channels on alluvial floodplains.<sup>9</sup>

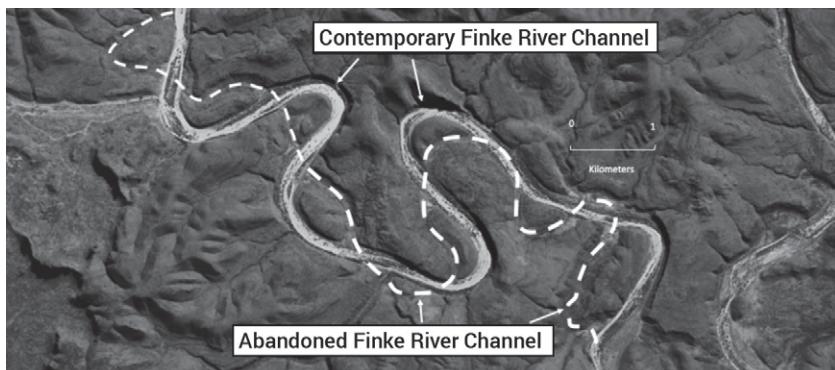
## Finke River and Ellery Creek features in the Krichauff Range, Australia

In a recent cursory examination of Australian water gaps, some minor but unusual morphological features were observed along the Finke River and Ellery Creek water gaps, particularly within the semi-arid Krichauff Range in central Australia south of Hermannsburg.

The Krichauff Range essentially consists of folded sedimentary rocks known as the Hermannsburg Sandstone, comprising red-brown sandstone, pebbly sandstone, and minor silty sandstone. While it is a region of varying relief, the ridges are characteristically 200–300 m above the valley floors.

Based on previous research the Finke River has been publicly proclaimed as possibly the oldest river in Australia. The largely sedimentary deposits that comprise the Krichauff Range are believed to have been uplifted around 300 million years ago. The water gaps are also believed to be considerably old. For instance, in an interview the Director of the Northern Territory Geological Survey states that “the Finke has followed exactly the same course for the past 15 to 20 million years”.<sup>10</sup> This is perhaps argued because the Finke exhibits deeply incised and sinuous meander bends through the range. A tributary of the Finke River, Ellery Creek, also flows through multiple water gaps.

However, Finke River and Ellery Creek, passing through many water gaps in their journeys, are better explained by Noah’s Flood rather than other ideas proposed.<sup>11</sup> In both catchments the rivers have developed water gap valleys through diverse topographic and geologic settings.



**Figure 1.** Finke River, Krichauff Range, showing both contemporary and abandoned features within a water gap (Google Earth)

For instance, Finke River and Ellery Creek have each created two pathways at the base of their valleys in the Krichauff Range, one contemporary and one abandoned (figure 1). For each system, both channels are found within a larger water gap valley. Moreover, in both instances the contemporary and the abandoned channels in these systems intersect frequently, their paths crossing over at least 10 times along the Finke River and at least five times along Ellery Creek.

Furthermore, a closer examination of these systems using Google Earth Pro shows that hills (sedimentary rock structures) exist between the contemporary and the abandoned channels in each system. These are usually over 30 m and up to 59 m in height between the contemporary and abandoned channels of the Finke River, and as low as 15 m (where the gaps are a minor distance apart) and up to 63 m in height between the contemporary and abandoned channels of Ellery Creek. This clearly eliminates any thought that the abandoned channels were formed by river channel migration across a floodplain that create ‘oxbows’ or abandoned channels.

Thus, both the Finke River and Ellery Creek have carved current and previous channels within the broader water gap valleys, such that these channels regularly intersect. For each valley there is a clear ‘active’ channel

and an ‘abandoned’ channel. Indeed, this is not the only example of such complexity, as a quick overview using Google Earth Pro reveals a similar pattern on the Hugh River 55 km to the east.

Since the contemporary and abandoned channels are intertwined (crossing each other’s path regularly), within these two catchments the antecedent and superimposed models of formation are redundant. Rivers are unable to rise over a host of hills and develop new channels adjacent to, and intersecting with, the original channels. Piracy is also removed as there is no evidence of one river system capturing the headwaters of another. The final explanation, of a past lake breaching the surrounding terrain, is also inadequate. After all, there is not one water gap valley, but two. Past lake breaches would need to have occurred in both catchments.

### Further research needed

Further research on these unique channel features may facilitate a deeper understanding of water gap formation in the Recessive stage of Noah’s Flood. For example, these features could have been developed in the following manners:

1. The water gaps may have housed an anastomosing flow pattern (two interconnected channels that capture a flood basin’s activity, especially in

low-energy conditions approaching base level) during the latter stages of the Flood. As the Flood’s erosive energy declined, then lower valley relief irregularities may have been retained, leading for a short period to multiple active channels.

2. Due to continuing upstream landscape changes there may have been a significant fluctuation in the volume of the receding Flood—perhaps a short-period increase leading to the formation of an entirely new channel and the abandonment of that already formed.

Other suggestions associated with changes in base level may also need exploring.

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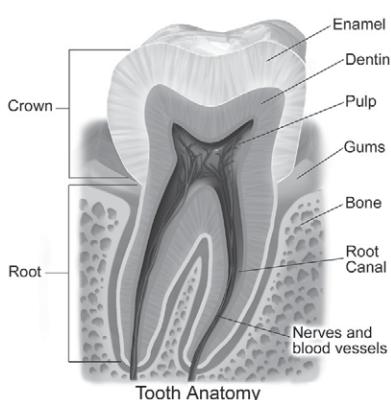
# The ‘poor tooth design’ claim refuted

Jerry Bergman

**I**t is often claimed that human teeth are poorly designed and this is why cracking, chipping, and fractures are common problems. When a tooth is cracked, it rarely can be appropriately repaired. Most often it must be ground down to the root or peg, and a new cap is glued on top called a crown, more precisely a new crown to replace the existing one (figure 1). As one evolutionist explained:

“I have three crowns now and my wife has four, and we are still young adults. I was not hit by a baseball bat that caused this problem. In fact, I was chewing nuts when one cracked and the other time I have no idea when or why it happened. On a routine visit to the dentist I was informed that my 2<sup>nd</sup> molar was cracked and needed to be replaced. Evolution explains this poor design. The fact is, if some design works better than an alternative design, the better design will be selected by evolution. Natural selection preserves only the better design, not the perfect design. Adaptations

Image: Blausen.com staff (2014)/CC BY 3.0



**Figure 1.** The top part of the tooth, or crown, is what is replaced in a dental crown replacement.

result from changes caused by random mutations, and some of the results are positively bizarre. The poor design of teeth is one excellent example. If they were designed by an intelligent designer they would not crack or chip for no good reason, or experience the problems that I noted.”<sup>1</sup>

Clara Moskowitz, *Scientific American*’s senior editor, wrote that evolution is

“... a weird, random, [and] not well-thought-out process ... things happen randomly and are not necessarily the best way to do something if you were going to design it from scratch. It’s just a way. Or it happened to be connected to some other gene. Things just happen.”<sup>2</sup>

She then explains that some of those things that ‘just happen’ are certain human body parts, such as teeth. Teeth, she concludes, are not optimally designed, and in fact were not the result of any design but were rather the product of mutations selected by evolution. Consequently, evolutionists conclude, they work well enough to enable us to survive, but are not the best design possible compared to intelligently designing them from scratch as a creator would have done. As evolutionists explain:

“Many organisms show features of appallingly bad design. This is because evolution via natural selection cannot construct traits from scratch; new traits must be modifications of previously existing traits. This is called historical constraint.”<sup>3</sup>

The argument from poor design, also known as the dysteleological argument, is used against the existence of a creator God based on the idea that an omnipotent and omnibenevolent God would not create organisms with the alleged suboptimal designs seen in nature. Phrases such as ‘poor design’, ‘suboptimal design’, or ‘unintelligent design’ are often used to support this view.

## The commonality of dental crowns

Single-implant crowns are now one of the most common prosthodontic procedures in the United States. Dentists, on average, place over two million crowns in patients annually.<sup>4</sup> A recent European study found over 30% of the adult population had a crown. A study of dental treatment of older people in New York City found that of the sample of 270 people over age 55, over 40% had crowns.<sup>5</sup> The number of crowns is not a good indication of the number of chipped and fractured teeth because crowns are done for many reasons, including repairing teeth that have had extensive fillings, due to the fact that crowns provide a more secure restoration compared to a regular filling. A dentist can fill a tooth only so many times. Each time the hole must be made larger, weakening the tooth framework. Consequently, after several fillings a crown, which is permanent, should be used. Cracking often occurs in old teeth which have amalgam restorations (figure 2) that expand on setting, creating micro fractures. Dentists now usually use composite materials with a bonding technique to avoid the cracking caused by amalgams.

Crowns surrounding the tooth act as a support, thereby helping to prevent fractures in the weak portions of the tooth. Crowns also improve the teeth aesthetics by replacing teeth that have extensive discolouration or silver/gold fillings. By providing support to maintain (especially posterior) teeth, crowns are also very important in stabilizing, restoring, and/or rehabilitating the patient’s occlusion (bite).<sup>6</sup>

## Crown repair failures

Looking at the data of crown failures helps put the failures of the original design in perspective. One study of the failure of teeth restorations



**Figure 2.** X-ray showing amalgam fillings (light parts)

found a significant number of failures during a 22-year evaluation. Of the 89 crowns placed in 428 adults by one dentist in Belgium from 1982 to 1999, 48% were judged well-functioning, 24% of the cases were not followed up due to the death of the patient, or movement to another city (or doctor) and other reasons, and 28% had failed. Failures were more often found in premolar teeth (34%) than in molars (27%). The median longevity of the dental work was 12.8 years for amalgam restorations, 7.8 years for resin restorations, and 14.6 years for crowns. Survival time was influenced by extension of restoration, patient age, pulpal vitality, and use of material and dentinal retentive pins.<sup>7</sup> Another long-term study, from 1986 to 1990, of posterior restorations of 61 patients and a total of 362 restorations, detected 110 failures (30%).<sup>8</sup>

### New research on enamel design

Critical to tooth failure is the outer coating of teeth, called the enamel (figure 1). We know that the underlying tooth dentin is designed to support the enamel and new research supports the conclusion that enamel is specifically designed to resist cracks. An excellent

review of the design traits of enamel are as follows:

“Dental enamel is the most highly mineralized tissue in the human body. Its outstanding mechanical properties combine the extreme hardness and stiffness with exceptional resilience, which enables it to withstand hundreds of masticatory cycles with biting forces of up to 770 N [173 Pounds of Force], in the harsh environment of the oral cavity, which also undergoes extreme pH and temperature fluctuations within the human body. Despite the fact that it does not remodel or repair, it lasts decades without catastrophic failure.”<sup>9</sup>

The (natural) tooth crowns in all tetrapods, including humans, are covered with enamel. Enamel is composed of carbonated hydroxyapatite packed at high density (95 wt%<sup>10</sup> in mature enamel), with only 1 wt% soft organic matrix and 4 wt% water. As is true of other biominerals, it must be space-filled, meaning few empty spaces exist in the tooth itself, in order to withstand the many forces that are part of chewing food. Chemically, enamel is a hierarchical nanocomposite material with a well-designed crystal organization, which is the key to its superior mechanical performance and the fact that it is both the hardest and most resilient human body tissue.<sup>9</sup>

Research has documented that teeth are ingeniously designed to prevent cracking. The building blocks of enamel are the enamel rods consisting of an array of aligned carbonated apatite crystals. The enamel design is morphologically aligned, parallel, ~50-nm-wide, microns-long nanocrystals bundled either into 5-μm-wide rods or their space-filling interrods. The orientation of the adjacent enamel nanocrystals is not parallel, but crossways, producing an important strengthening mechanism. If all crystals were parallel, a transverse

crack would be able to propagate across the crystal interfaces, causing cracking failure. In contrast, because the crystals are *not* parallel a crack propagates primarily along the crystal *interfaces*, resulting in material toughening as a result of this crack deflection mechanism.

Within each rod, the crystals are not co-oriented with one another or with the long axis of the rod: the c-axes of adjacent nanocrystals are most frequently re-oriented by a 1° to 30° slope compared to the adjacent nanocrystals. Furthermore, this orientation within each rod gradually changes, producing an overall angle spread that varies between 30° and 90°. The best illustration of why this design is used is plywood, which consists of many thin layers of wood glued together. For each layer, the grain is oriented in a different direction to that of the layer below it, usually at a 90° angle compared to the previous one. This design is critical for plywood’s strength and resistance to warping and splitting. Molecular dynamic simulations demonstrate that the observed re-orientations of adjacent enamel crystals cause crack deflection and, thus, resist cracking. This toughening mechanism contributes to the unique resilience of enamel, which for most healthy people lasts a lifetime under extreme physical and chemical challenges.<sup>9</sup>

Conversely, dietary mineral (especially fluoride) and vitamin deficiencies can disrupt proper development during enamel growth in childhood, causing teeth to be liable to crack and experience other problems.<sup>11</sup> Eating a diet *high* in fruits and vegetables, and *low* in acidic beverages (fruit juices, carbonated drinks, and alcohol), especially during tooth development in youth—as well as not smoking or chewing tobacco—has been found to contribute to sufficiently high-quality enamel development.<sup>12</sup> Bulimia and anorexia cause movement of stomach

acid into the oral cavity, which destroys tooth structure. Chewing biltong, ice, beef jerky, or hard sweets can also damage the enamel. Bruxism (clenching or grinding the teeth), often triggered by stress, anxiety, or guilt causes abnormal tooth wear. Malalignment and missing teeth can cause one to chew in an odd way if one side of the mouth is favoured in chewing, and this may increase the risk of fracture. This is one reason dentists recommend replacing missing teeth with implants, dentures, or bridges.

Lastly, mutations can produce genetic diseases that cause tooth abnormalities, affecting the rate of development of primary and secondary teeth, causing them to become brittle. One of many examples is the disease *Dentinogenesis imperfecta*, which interferes with normal tooth development, affecting as many as 1 in 8,000 people.<sup>13</sup>

## Summary

The cause of susceptibility to cracking, chipping, and tooth fractures is not poor design but most often poor diet leading to mineral and vitamin deficiencies in particular, especially during early tooth development. Recent research confirms that teeth are specifically designed to strongly resist cracking. As Elia Beniash, Ph.D. *et al.* concluded, the ingenious design of tooth enamel contributes to its being

“...extraordinarily resilient, as it endures hundreds of mastication cycles per day, with hundreds of Newtons of biting force. This structure prevents catastrophic failure of enamel by deflecting cracks inside rods, and keeps it functional for our entire lifetime.”<sup>9</sup>

Rather than blame the problem on design, the problem is often the poor health habits of the patient. The solution is clear: improve dental health by taking steps to remedy the health habits of those affected. The problem for design deniers is that each year scientists

research the functions of various biological organisms, discovering and documenting ingenious design details and the constraints within which biological organisms must function. If humans do not know completely how something functions, how can a poor design charge be laid against God?

The poor-tooth-design claim is another argument that research has forced to be retracted.<sup>14</sup> The clear trajectory of scientific discovery supports the view that the world we live in is more complex than previously believed, not less. Science is going in the wrong direction by making the argument from poor design, because this argument is simply ‘atheism of the gaps’ that is forced by research to be progressively abandoned as science advances.

## Acknowledgments

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# What is the meaning of an ammonite found in amber?

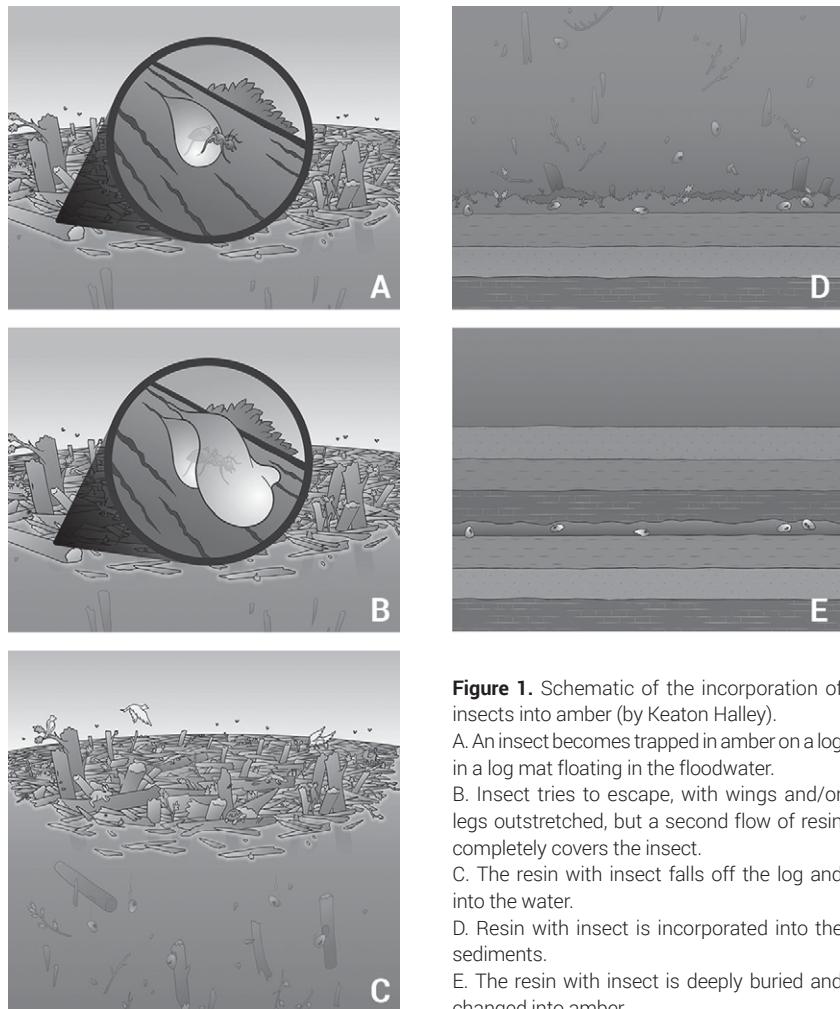
Michael J. Oard

**A**mber is hard, brittle fossil resin, fossilized pitch, that is derived mostly from coniferous trees, especially the araucarian conifer, also called the Kauri pine, currently found today only in New Zealand. Amber is usually yellow to brown in colour and is translucent or transparent. Rare types also occur, like blue amber from the Dominican Republic. Copal is hardened and semi-fossilized tree resin and similar to amber. These resins are typically released from trees as a result of trauma.<sup>1</sup>

Amber is found at hundreds of sites worldwide as early as Upper Paleozoic in the geologic time scale,<sup>2</sup> though most is found from the Cretaceous through to the Miocene.<sup>3</sup> The youngest amber from the Miocene is found in the Dominican Republic,<sup>4</sup> the western Amazon basin,<sup>2</sup> New Zealand, and Australia.<sup>5</sup>

## Organisms in amber

Many different types of organisms are entombed in amber. Insects are the most common, often with their wings and legs extended. However, there are also spiders, feathers,<sup>6</sup> bacteria, fungi, algae, slime molds, mosses, liverworts, ferns, conifers, flowering plant parts, protozoa, nematodes, rotifers, mollusks, worms, flowers,<sup>7</sup> microorganisms,<sup>8</sup> mushrooms,<sup>9</sup> bones of a small mammal,<sup>10</sup> a crab,<sup>3</sup> scorpions, small lizards, frogs,<sup>4</sup> and a mole cricket that burrows into the ground.<sup>11</sup> Even the faecal remains of a small insect were found in Spanish amber.<sup>12</sup> Mammal hairs have also been found in



**Figure 1.** Schematic of the incorporation of insects into amber (by Keaton Halley).

- A. An insect becomes trapped in amber on a log in a log mat floating in the floodwater.
- B. Insect tries to escape, with wings and/or legs outstretched, but a second flow of resin completely covers the insect.
- C. The resin with insect falls off the log and into the water.
- D. Resin with insect is incorporated into the sediments.
- E. The resin with insect is deeply buried and changed into amber.

Cretaceous amber from the ‘age of the dinosaurs’.<sup>13</sup> One of the more interesting fossils encased in amber is a tiny gecko foot with modern-looking toe pads discovered in an amber mine in Myanmar.<sup>14</sup> It is possible that a flowering plant was found in Late Paleozoic amber in Carboniferous coal in Illinois, believed to be 320 million years old within the evolutionary timescale.<sup>15,16</sup> Evolutionary scientists dispute this because they believe flowering plants did not ‘evolve’ until 200 million years later.

## A marine ammonite found in amber

It has recently been reported that an ammonite, a marine organism, was

found in Burmese amber in northern Myanmar, where 500 families of organisms are represented.<sup>17</sup> The piece of amber was 33 mm long, 9.5 mm wide, 29 mm high, and weighed 6.08 g. The ammonite was a juvenile only 12 mm in diameter with the original aragonite shell. The shell was partly missing, damaged, and filled with coarse sand-sized shell fragments that were also present in other parts of the amber. The ammonite was presumed dead when it was incorporated in amber, since no soft body parts were found.

Besides the ammonite, many other creatures from marine and terrestrial environments were also entombed. These include gastropods and marine or littoral (beach) isopodes. The

terrestrial creatures include mites, spiders, millipedes, a cockroach, beetles, flies, and wasps.

Secular scientists presume that the resin formed from trees near the beach and fell onto the beach where dead marine organisms were washed ashore. The researchers admit that this environment should have pulverized the resin: “the probability of such amber pieces surviving would be slight, owing to the dynamic nature of beaches”.<sup>18</sup> Another problem is that sand should have been incorporated into the amber.

### Aquatic and marine organisms sometimes found in amber

Finding an ammonite, gastropods, and isopods in amber supports amber forming in an aquatic or marine environment.<sup>19</sup> Amber found in other locations also include numerous aquatic and marine organisms, such as diatoms, radiolarians, sponge spicules, bits of coral, foraminifera, and a spine of a larval echinoderm.<sup>20</sup> Surprisingly, shark teeth have been found in some sedimentary rocks that contain the amber. How does a terrestrial tree resin end up entombing marine organisms?

### Origin of amber unknown

For amber to form, tree resin must be released into water lacking oxygen (i.e. reducing conditions).<sup>4</sup> Otherwise, oxygen would dissolve the amber. It seems unlikely that this could happen in a forest. All water bodies are well oxygenated at shallow depths. Adding to the mystery is that amber is found in marine sedimentary rocks.<sup>21</sup> Amber is commonly associated with low-grade lignite coal, suggesting that amber formed under similar conditions to that of coal. In defiance of uniformitarian science, it is not forming today.<sup>22</sup>

All these conundrums for a uniformitarian approach to amber mean secular scientists cannot explain the

origin of amber.<sup>23</sup> Martinez-Declòs *et al.* ask: “How is amber transported from the producing tree to the sediment in which it is preserved?”<sup>24</sup>

### The ammonite reinforces amber a result of Flood log mats

The discovery of an ammonite, gastropods, and isopods in amber suggests the amber formed during Noah’s Flood. The violence of the Flood would have torn up vegetation including trees. These would be gathered into large log mats by currents.<sup>19,25</sup> Numerous organisms from widely different environments would have been temporarily marooned on the floating log mats. Resin thus would flow freely from the damaged logs as they continued to smash against one another (figure 1a). Organisms would often find themselves trapped in the abundant resin. Indeed, it usually took a second surge of resin to cover the insects (figure 1b). Aquatic and marine organisms, some mired in resin, washed off the logs (figure 1c), and sank to the bottom of the floodwater (figure 1d). The resin would be buried by sediments, heated, and subsequently fossilized (figure 1e). The amber-encased ammonite lends unique support to the log-mat model during the Flood.

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# Plants feeding on quartzite support rapid plant growth after the Flood

Michael J. Oard

Once the continents emerged above water during the Recessional stage of the Flood, plants likely started growing on the newly exposed land.<sup>1</sup> Log and vegetation mats that contained seeds, spores, and plant debris including roots would have been left on the new land. These mats would also have floated on the oceans for many years after the Flood, dispersing animals and vegetation to many land areas.<sup>2,3</sup>

These factors explain why the dove returned to the Ark with a fresh olive leaf approximately 120 days after the Ark landed (Genesis 8:10–11). Olive trees would have been among the first to grow, since they can germinate by vegetative propagation from a branch as well as by seeds. Noah waited another 101 days before he released the animals from the Ark. This waiting period gave enough time for seeds to germinate and grow enough to provide food for the animals.

Plants and trees can recover fast on devastated land. Despite dire predictions of a long-lasting sterile landscape, the recovery of Mount St Helens after the 1980 eruption shocked scientists and demonstrated to the world just how fast nature can recover after a disaster.<sup>4</sup>

## Some plants discovered feeding on quartzite

Another mechanism for fast plant growth has recently been discovered on a nearly sterile landscape in Brazil.<sup>5,6</sup> Quartzite, a metamorphic sandstone

that is almost pure quartz, makes up the bedrock of a region called *campos rupestres* (Portuguese meaning ‘rocky grasslands’). The soil from this area is shallow and patchy with nearly undetectable levels of nutrients needed by plants. However, it sustains more than 5,000 plant species! Some of the plants even survive on bare patches of quartzite bedrock.

Quartzite is almost pure silica and has extremely little phosphorus, one of the main elements needed for plant growth. But despite the very low amount of phosphorus, roots from plants of the Velloziaceae family bore into the quartzite to obtain it. This is a never-before observed root specialization. The roots, which are very hairy (figure 1), penetrate the quartzite at least 10 cm along former sandstone bedding planes. The roots give off acids that dissolve the rock.

A byproduct of this root specialization is that it increases weathering and soil formation. This helps other plant species to colonize the area and accounts for the observed diversity of plants in this nutrient-deprived area.

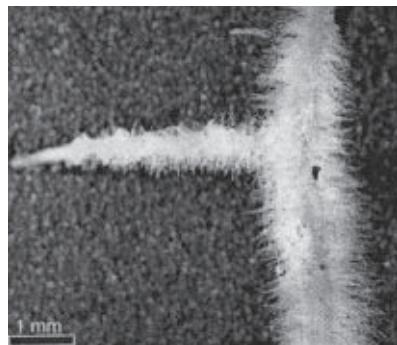
## Plants in other areas also have specialized roots for obtaining nutrients

The researchers mention that other plants in *campos rupestres* and in other areas of the world have different root specializations that take advantage of limited nutrients in the soil, including in other nutrient-poor landscapes:

“Similar processes are likely occurring in other landscapes. For example, roots of *Pinus sylvestris* are capable of dissolvingapatite, and this process may involve mycorrhizal symbionts.”<sup>7</sup>

## Implications

We are increasingly discovering that many of the plants that colonized the earth after the Flood had root specializations that would have aided growth in even nutrient-poor soil or



**Figure 1.** Roots of *Barbacenia tomentosa* penetrating quartzite<sup>8</sup>

bare rock. This reflects a creation usefully *designed* to bounce back from a calamity, e.g. the Genesis Flood. In the case of the Velloziaceae family, even bare quartzite rock produced growth. The combination of newly laid soil, scattered seeds that survived the Flood, log mats, and the unique ability of plants to squeak out nutrients from unlikely places all add up to a rapid recovery of the earth’s vegetation after the Flood.

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# The upper limits of survivability of bone material

Paul Price

In 2015, then-graduate student Dr Hirotugu Mori created a stir<sup>1</sup> by proposing a new species of duckbill dinosaur; and then again (though this was not reported in the popular media) when others began to realize he had let it slip in his paper that these bones were mostly unpermineralized (figure 1).<sup>2</sup> Permineralization refers to the process (often colloquially known as fossilization) whereby the original organic substances of the specimen are replaced by minerals, turning it to stone. This is in contrast to ‘biomineralization’, which simply refers to the use of minerals in various life forms to harden structures in their bodies (like bones containing calcium, for example).<sup>3</sup>

Similar to Mary Schweitzer’s finding soft tissue, red blood cells, etc., in dinosaur bones<sup>4</sup>, finding these ‘fresh’ dinosaur bones in Alaska raises many important questions. As we have argued, it is inconceivable that these bones could have lasted the alleged 69 Ma since the ‘Cretaceous period’<sup>5</sup> when these bones were supposed to have been laid down according to evolutionary dating.<sup>6</sup>

## Bone decay as a dating method

Any ongoing predictable process can, in theory, be used as a ‘dating method’ by the process of extrapolation. Could bone decay rates be a dating method independent of other factors that are often used to assign dates? Forensic scientists have long been interested in determining the length of time that has elapsed since death of remains (postmortem

interval), due to the applicability of this to criminal investigations. Unfortunately, this has proven a difficult challenge because of the sheer number of factors that influence the rate at which decay proceeds (things like insect activity, environmental factors like water, exposure to air, soil acidity, etc.).<sup>7</sup>

## A general picture of the length of time

In general, the bones of a cadaver would begin to decay and break down within a decade if left on the surface.<sup>8</sup> However, buried remains generally decompose at roughly one eighth the speed of those left above ground.<sup>9</sup> Via some simple math, we would then arrive at an assumption that buried bones should be mostly decayed away within the first 80 years after burial (unless they are permineralized).

This highly oversimplified generalization may hold true in many cases, but known cases of bones being

discovered from many hundreds of years ago proves that unfossilized bone can certainly last longer than a mere 80 years:

“The time required for complete degradation of buried skeletal and dental remains is extremely lengthy, with breakdown taking anywhere from several years to hundreds, as demonstrated by the survivability of archaeological specimens.”<sup>10</sup>

For example, in one study, ancient bone samples from various eras were evaluated. Although “post-medieval bones were solid”, the “Roman/early medieval bones were fragile, and many graves contained only slight traces of bone, if any.”<sup>11</sup>

All things considered, there appears to be a case to be made that the upper limit of ‘fresh’ bone survivability over time would be in the range of a few thousand years at the absolute uppermost, barring other factors such as permineralization, mummification, etc. which would extend the timespan of durability. The idea that these



**Figure 1.** Original pores in spongy bone from freshly exposed interior of a Triceratops brow horn core from the Upper Cretaceous Lance Formation shows that minimal permineralization has occurred.

largely unpermineralized hadrosaur bones could be 69 Ma old is certainly at odds with everything we know about decomposition. It is even strange that we should still find them intact after the roughly 4,500 years that have elapsed since the Flood.

### How did they last 4,500 years?

Bone consists in large part of type 1 collagen, and is hardened and strengthened by interwoven calcium hydroxyapatite crystallites.<sup>12</sup> The estimated upper limit for the survival of bone collagen is between 0.2 and 0.7 Ma at 10°C, though it might be imagined to last up to a couple million years if kept constantly below freezing temperatures.<sup>13</sup> Original experimentation in artificial diagenesis by Dr Brian Thomas showed a half-life of (porcine) bone collagen at 7.5 °C of 1,678 years—much less even than the half-life of <sup>14</sup>C (5,730 years).<sup>14</sup> Given that a “a lump of <sup>14</sup>C as massive as the earth would have all decayed in less than a million years”,<sup>15</sup> what does this imply about the maximum possible age of unpermineralized bone samples still containing bone collagen (which were by no means kept at constant ideal temperatures in the field)? Alaska’s freezing temperatures, combined with the fact that the bones display a light outer coating or ‘stain’ of permineralization,<sup>16</sup> may provide an explanation for how the hadrosaur bones were able to persist as long as they have in their relatively pristine condition.<sup>17</sup> However it should be noted that on an evolutionary timescale, the climate of the area in which they were found would have been significantly warmer than it is today.<sup>5</sup>

### Concluding remarks

This research (both from laboratory and field studies) strongly suggests that the discoveries of unpermineralized bone in strata dated to periods of deep geologic time represent a powerful

and persuasive argument against the entire secular worldview and its geologic ages, offering instead strong support for a relatively ‘young’ Earth. According to one popular source, the oldest bones to be discovered in a non-permineralized state are human remains from Ethiopia dated to 2.8 Ma. Apparently the author was unaware of Mori’s research into the hadrosaur remains dated at 69 Ma.<sup>18</sup> Unpermineralized bones within deep-time strata are likely a more widespread phenomenon than the popular media lead the public to believe, judging by the complete omission of this aspect in all reporting on the Alaskan hadrosaur finds and the subsequent scuffle in the reporting journal over the wording of the description.<sup>19</sup>

This is an area calling for much more study in the future, including the excavation and examination of specimens in the field when possible. Much good work has been done recently by researchers such as Dr Brian Thomas of the Institute for Creation Research<sup>14</sup> as well as the ongoing iDINO II project of the Creation Research Society.<sup>20</sup> Considering the extreme weight of prejudice in the secular world to regard these sorts of finds as ‘anomalous’ (as well as a lack of impetus to search them out to begin with), the creation science community should not rely on the mainstream secular scientific community to complete these tasks on our behalf.

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# The origin of flightless birds

Michael J. Oard

Some organisms in nature have lost an organ or the ability to use an organ. This is commonly observed in insects that have lost their wings on islands<sup>1,2</sup> and blind cave fish.<sup>3</sup> Moreover, the loss of sight in cave fish is just a variation capable of rapid reversal, as shown when researchers mated blind cave fish from one cave with other strains of blind cave fish, and their offspring had eyes.<sup>4</sup>

## Origin of flightless birds on islands

The origin of flightless birds, especially those found on islands, is also a challenge because evolutionists believe it is a form of evolution.<sup>5</sup> Flightless birds are known from Madagascar, Australia, New Zealand, islands of the south-west Pacific, South America, and elsewhere. Many of these birds went extinct during the past 2,000 years, likely because of human hunting. For instance, many scientists think the giant moa of New Zealand went extinct 400 years ago when it was colonized by the Polynesians. There were several flightless birds in New Zealand at the time, but the moa was the largest, standing 3–3.7 m tall and weighing about 240 kg. Moa skeletons have been found by the hundreds in New Zealand swamps indicating just how common they once were. Moreover, Feduccia, an evolutionary ornithologist, notes that there are or were flightless birds on numerous islands across the South Pacific—at least one flightless species on almost every large island, including the remote Hawaiian Islands.<sup>6</sup>

How were these birds able to colonize these disparate areas? Creation science has three options. First, people

carried the birds with them for food on a long voyage and some escaped or were allowed to escape after they arrived on a distant island. Second, the ancestors of these birds could fly and their descendants became flightless and increased in size after arrival. Third, the birds could never fly, but they were carried to these isolated areas on log or vegetation mats soon after the Flood.

Cserhati reports that the white-throated rail flew to several islands in the south-west Indian Ocean from Madagascar and Mayotte and rapidly lost their ability to fly—several times on different islands under specific conditions.<sup>7</sup> Mayotte is part of the Comoros Archipelago between northwest Madagascar and south-east Africa. Specific conditions favouring their survival are the lack of predators and other animals that would compete for food. The authors of the original article in *Zoological Journal of the Linnean Society* believe the loss of flight demonstrates ‘evolution’. But how can this be, since it is a loss of function and information rather than a gain?

## Flightlessness believed caused by regulatory DNA

Many evolutionists now believe the reason for flightlessness was a change in regulatory DNA that controls flight and not from mutations in protein-coding genes.<sup>8</sup> Regulatory DNA determines when and where genes are turned off or on, often due to environmental cues. To establish their case that the loss of flight arises from changes in regulatory DNA, the researchers used DNA that did not code for proteins and found that it was responsible for turning off genes for flight, which would eliminate the mutational mechanism. However, the researchers were not specific about how changes in regulatory DNA caused a loss of flight. Moreover, they admitted that mutations in

protein-coding genes could be the cause of flightlessness in some species.

The researchers, of course, put an evolutionary spin on it, claiming that that such a loss of flight in so many birds is due to ‘convergent evolution’, defined as: “the independent evolution of similar phenotypes in divergent taxa”.<sup>9</sup> However, there are several problems with this. First, one researcher said that whatever the cause, it seems like an ‘easy’ change:

“Rather, the ancestors of ratites [the diverse group of flightless birds] probably could fly and tinamous retained that ability, while related birds lost the ability, mostly because of changes in regulatory DNA, he says. ‘My hunch is that it’s relatively easy to lose flight.’”<sup>10</sup>

Moreover, the change could occur quickly:

“How much time is necessary for flying birds to lose their powers of flight has been a subject of some controversy. In the past it has often been thought that vast time spans were required—tens of millions of years perhaps; but it now seems more likely that the evolution of



Image: Vince Smith/CC-BY-SA 2.0

**Figure 1.** *Gastornis*, a large flightless bird from the Eocene of Wyoming, USA

flightlessness and the concomitant attainment of large size, as seen dramatically in the ratites, needs relatively little time, especially on islands.”<sup>11</sup>

In other words, ‘convergent evolution’ in the case of ‘acquiring’ flightlessness is just an evolutionary name put on a process both creationists and evolutionists agree happens.

Second, the molecular mechanisms of this are not well understood.<sup>9</sup> However, since flightlessness seems to occur so easily, rapidly, and often, how likely is it to be the result of random mutation and natural selection?

Finally, the researchers admit that the opposite, the regaining of flight, such as what many believe happened with the tinamous, is problematic:

“The alternative—a single loss of flight at the base of the paleognaths, followed by a regain of flight in tinamous—appears implausible given evidence for repeated losses of flight across birds and the lack of any evidence for regains of flight after loss . . .”<sup>9</sup>

If it is easier to lose flight than regain it, then it clearly is much harder again to gain flight for the first time. As such, this disparity counts as evidence against microbes-to-man evolution.

## Implications

Evolutionists now attribute the loss of flight (or at least in most cases) to changes in regulatory DNA, and believe it could happen quickly and easily. This suggests that the change in the regulatory DNA could simply be part of the variety built into some birds at Creation. Flightlessness then could have resulted from environmental cues, often associated with isolated islands, that turned off regulatory DNA, when flight was unnecessary.

The suggestion that flightlessness was built in at Creation is shown by the existence of flightless birds in the Cenozoic fossil record, such as *Gastornis*, an extinct genus from the early Cenozoic that was 2 m tall

(figure 1). These birds are undoubtedly from the Flood,<sup>12–17</sup> and represent pre-Flood birds.

The new research reveals the likelihood that post-Flood flightless birds made it to the remote locations by flying. Since it could be difficult to fly long distances over water, the flying birds could have found refuge on the remaining log or vegetation mats left over after the Flood.<sup>5,18</sup> One factor favouring the existence of these post-Flood log or vegetation mats is that many creatures (e.g. insects that cannot fly long distances, as well as many mammals, amphibians, and reptiles) also made it to remote islands, including the Hawaiian Islands and Madagascar.<sup>19</sup> The Hawaiian Islands are among the most isolated set of islands in the world, but they have an incredible endemic diversity of organisms, including spiders, land snails, crickets, fruit flies, molluscs, and various birds.<sup>20</sup> It seems that log or vegetation mats are a plausible way to colonize the Hawaiian Islands.

Even evolutionists are forced to believe that vegetation mats must have aided the transport of numerous exotic creatures over large water bodies.<sup>21,22</sup> Their problem is generating so many vegetation mats that are large enough to do the job. However, this is not a problem for the biblical model, as the Flood would generate more than enough log mats.

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# Salt management and evolution

Philip B. Bell

We are familiar with the iconic images that attempt to portray the fish-to-tetrapod transition that typically is believed to have occurred some 385 million years ago. But what evolutionary changes would have been required to enable dedicated marine organisms to conquer terrestrial habitats? Most obviously, fins would need to strengthen markedly, developing weight-bearing elbows and bendable wrists. The incipient forelimbs and hindlimbs would need to develop digits. And, of course, these putative limbs would require the acquisition of associated complex musculature as well as their secure attachment to the developing pectoral and pelvic girdles respectively. The foregoing aspects of ‘redesign’ are fairly obvious ones, but numerous physiological ‘problems’ also had to be solved for the alleged conquest of land to have taken place during the mid-Devonian.

## Keeping salt in or out?

A formidable challenge faced by any would-be fish-a-pod is what to

do about salt. A failure to control the salt content of the body fluids (0.9% in humans) plays havoc with blood pressure. Marine animals live in an aqueous medium in which the salinity is about 3.5%; actually 34–37 parts per thousand. This is principally due to  $\text{Na}^+$  and  $\text{Cl}^-$  ions—but  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$ , and  $\text{SO}_4^{2-}$  also contribute—these six constituents together constituting about 99% of this salt.<sup>1</sup> Marine fish face the challenge of keeping salt *out* since the salinity of their blood is a lot lower than the sea water. Without the constant excretion of salt, regulated via the kidneys and the gills, they would lose too much water from their body tissues by osmosis.<sup>2</sup> In stark contrast, the supposed transition of ocean-going animals up onto land (whether into fresh water or subaerial habitats) faces a formidable problem: how to hold on to salt. Research published in *Proceedings of the National Academy of Sciences* is claimed to have shed light on this evolutionary dilemma.<sup>3</sup>

The kidneys are key organs of osmoregulation in vertebrates such as humans. It is well known, for instance, that hypertension (high blood pressure) has potentially deadly consequences. It is now understood that the proper functioning of mineralocorticoid (aldosterone) receptors (MRs) is vital.<sup>4</sup> Indeed, any impairment or interruption of these receptors is strongly linked to kidney pathology.<sup>5</sup>

Since renal MRs are found throughout terrestrial vertebrates, evolutionary scientists consider that they have been conserved over hundreds of millions of years. However, in marine fish the MRs help eliminate excess  $\text{Na}^+$  ions; conversely, in humans and other terrestrial animals the MRs operate in reverse to retain salt. Moreover, the hormone ligands that turn MRs *on* in fish (progesterone and spironolactone) turn them *off* in humans.<sup>3</sup> The PNAS paper’s lead author, Prof. Peter Fuller (*Hudson Institute of Medical Research, Australia*) believes that a better understanding of these MRs would help solve the salty problem faced by our ‘Devonian ancestors’. He and his team created a chimera MR (a hybrid of human and zebrafish MRs) and compared its action with that of zebrafish and human MRs.

Where the zebrafish MR has the amino acid leucine in helix 8 of its ligand-binding domain—and this is true for other fish species too—humans and most other terrestrial vertebrates have threonine (rodents have serine). When the researchers substituted leucine for threonine (in the hybrid) the MR’s response to ligand-binding changed from agonistic (*on*) to antagonistic (*off*).<sup>3</sup> Understandably, Prof. Fuller and his team are encouraged by this neat result: “We may be able to design drugs that target previously unrecognized interactions within the receptor, rather than just blocking it.”<sup>6</sup>

## Nice research, wrong conclusions

However, these findings are a far cry from demonstrating how the claimed evolutionary transition from sea to land or freshwater took place (see figure 1). A whole suite of physiological changes would need to occur simultaneously for such a fundamental alteration to osmoregulatory function to be adaptive rather than lethal. Assuming that some fish species *could* undergo such a radical switch in renal MR



**Figure 1.** The possibility that osmoregulatory function in fish might be altered via mutation of MR genes provides no support for the supposed evolutionary conquest of terrestrial environments.

function—perhaps enabling marine species to survive in brackish or even fresh water (e.g. by swimming up estuaries or by being stranded in low-saline lakes following large-scale flooding of continental margins)—the physiological plasticity of the body overall would actually bespeak superlative, front-loaded design, as many body subsystems adjust, *within* the limits and parameters already encoded within the genome.

A number of extant fish species are known to transition very successfully between marine and fresh water (e.g. eels and salmon, famously) and it would be interesting to explore the outcome of tinkering with their renal MRs. However, fascinating though these experiments on fish-human hybrid MRs are, it is wishful thinking to claim, as did one headline, that they “reveal how animals left the oceans”.<sup>6</sup> Rather, this research could yet throw light on how some fish and other aquatic vertebrates may have survived the Flood of Genesis 6–8.<sup>7</sup>

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# What's the point of the pyramids?

Gavin Cox

**T**here is evidence from the Great Pyramids of Egypt that may well be testimony to the events of creation and the Flood. It is literally the point of the pyramid, the so-called ‘benben’, which points towards this evidence. The benben, or the primeval mound, represented in the minds of the ancient Egyptians the first land that appeared from the primeval ocean, called the ‘Nun’. It was upon this land that the first eight ‘gods’ sprang into being; four males and their wives, headed by the chief god, called ‘Nu’. This all sounds remarkably evocative of Noah’s family stepping onto the land after the Flood.

Such connections are to be expected when we remember that Egypt in the Old Testament is called ‘the land of Ham’ in the Psalms, and is called ‘Mizraim’ throughout the Hebrew Old Testament.<sup>1</sup> Ham, Noah’s son, would have naturally taken with him knowledge about creation and the Flood, passing it on to his son Mizraim, and on through the generations.<sup>2</sup> The

Egyptian civilization is one of those, along with Mesopotamian ones, which arose much sooner following the Flood than others around the world—not surprising since the point of dispersal for humanity was ‘the plain of Shinar’ (Sumeria/Mesopotamia).

## The benben—the point of the pyramid

There are numerous examples of benben stones stored in museums around the world. A famous example of a benben, presently kept in the Cairo museum, belonged to the 12<sup>th</sup> Dynasty Pyramid of Amenemhat III (see figure 1).

Egyptologist James Allen explains the ancient Egyptian ideas of creation: “The benben was a pyramid-shaped mound symbolizing the first land that appeared from Nu at the creation.”<sup>3</sup> The Nu (or Nun) was the Egyptian idea of a primeval ocean, or flood. The benben stone was a central feature of the more ancient solar temples, which Egyptologist David Silverman states

“... were constructed, in addition to the pyramids, by six Fifth-Dynasty kings and based on the sun temple of Heliopolis. The focus of each temple was an altar before a benben,



Image: Merja Attia/Flickr.com

Figure 1. Benben stone from a 12<sup>th</sup> Dynasty pyramid

a squat obelisk with a pyramid point representing the hill over which the sun rose at the beginning of creation.”<sup>4</sup>

### Up from the depths

The idea of the primeval mound rising up from the primeval ocean occurs in two versions, one from Heliopolis (which is now a suburb of modern Cairo), and the other from Hermopolis (located 322 km south of Cairo, at the modern city of El Ashmunein).<sup>5</sup> These ideas are evocative of the accounts of both creation and the Flood in Genesis. To explain: during Creation Week, God called the dry land to appear from the Great Deep on Day 3 (Genesis 1:9, 10). At the end of the Flood the text states: “And the waters continued to abate until … the tops of the mountains were seen” (Genesis 8:5). In both cases, land emerges from a state of watery chaos. It may also be significant that the word ‘Nu’ is linguistically very close to the name of Noah, which is still Nûh in modern Arabic, for example. In the Heliopolitan version, after the primal mound arose from the Nun, onto it sprang an Egyptian creator god, called Atum. He created two children called Shu and Tefênet.<sup>6</sup>

Within pyramids that are from an era in the Old Kingdom called the 5<sup>th</sup> Dynasty are inscribed pyramid texts (PT) which were believed to protect the deceased pharaoh in the afterlife. The pyramid of a pharaoh called Pepis II has inscribed in it a spell:

“O Atum … you became high on the height, you rose up as the *bnbn*-stone in … Ôn, you [created] Shu, and Tefênet … O Atum, set your arms about the King, about this construction, and about this pyramid … that the King’s essence may be in it, enduring forever …”<sup>7</sup>

This inscription describes the hope of the pharaoh for the afterlife in relation to his pyramid.



**Figure 2.** Wall painting, c.1164–1157 BC, showing Ra-Atum slaying Apophis at the Ished tree

### Biblical connections to place names

The city mentioned in this pyramid text occurs in the Bible as “Ôn”, where one of Joseph’s wives, Asenath, is introduced as “the daughter of Potipherah priest of Ôn” (Genesis 41:45, 50; 46:20). The Greeks called the city ‘Heliopolis’, meaning ‘City of the Sun’. The Egyptians called Ôn ‘Iunu’, which means ‘pillar’ (or obelisk, in reference to the benben).<sup>8</sup> The chief temple of Ôn was called the ‘Great House of Atum (Per-Atum)<sup>9</sup>, which occurs in the Bible as ‘Pithom’,<sup>10</sup> the place where the Hebrew slaves built Pharaoh’s grain stores (Exodus 11:1). However, the Hebrew slaves were not responsible for building the pyramids; that is a myth started, surprisingly, by Josephus, the Jewish historian.<sup>11</sup>

### Atum who?

The ancient Egyptians viewed Atum as a solar deity (Re), and in his role

as a creator-god his responsibility was to hold back the forces of chaos by destroying the evil snake called Apophis. In tomb paintings,<sup>12</sup> and in papyrus rolls buried with mummies—containing spells for protection in the afterlife, called The Book of the Dead—are a number of colourful images that depict Apophis being slain by Re-Atum. He is depicted in the form of a tomcat, which the Egyptians considered the natural enemy of snakes (figure 2). Re-Atum is depicted either cutting off or stamping on the head of Apophis, a ritual re-enacted by the priests of Ôn, with models of snakes.<sup>13</sup>

In front of Re-Atum and Apophis is the sacred Ished tree, which was believed to grow on the primal mound at Heliopolis. The Ished tree was linked to wisdom, as evidenced from inscriptions at Ramesses’ II temple at Thebes (c. 1300 BC), which picture Thoth (the god of wisdom) seated on a throne and Sheshat (a goddess of writing, known as ‘foremost in the library’) standing alongside, writing

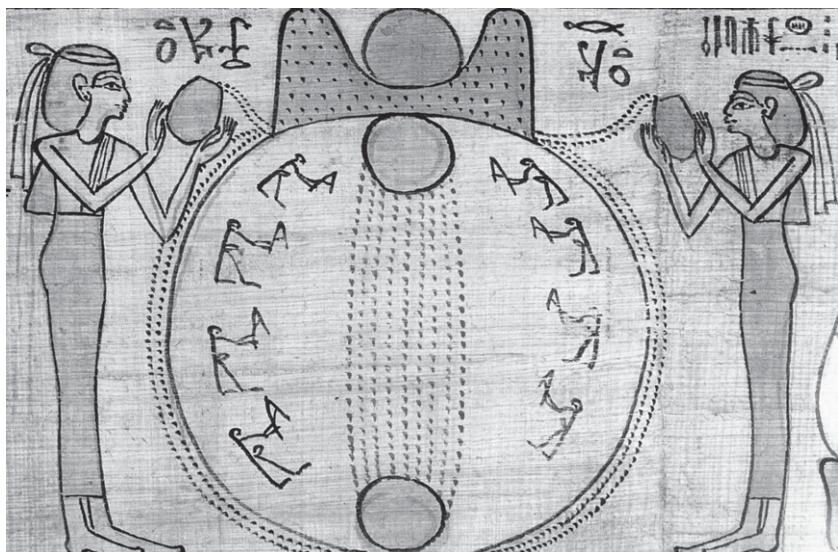
on the tree's leaves.<sup>14</sup> Many of these aspects are evocative of the Fall narrative in Genesis 3, although the Egyptian telling is somewhat on its head when we consider Adam was vanquished by the serpent at the Tree of Knowledge. The Gospel promise is that the Last Adam would be the One to crush the serpent's head (Genesis 3:15 cf. Romans 16:20; 1 Corinthians 15:25).

### Then there were eight

The Hermopolitan version of the primeval mound rising from the Nun involved eight creator gods springing onto the mound at the first sunrise. This group are known as the 'Ogdoad' by Egyptologists (from Greek, meaning 'eight'), consisting of four males and their wives.<sup>15</sup> The chief was called Nu, who was described as 'the father of the gods'.<sup>16</sup> Their names appear in the Pyramid Texts, either as divine titles (Nu and Naunet, Amun and Amunet), or concepts that describe the forces of chaos—Kek, meaning 'darkness', and Heh, meaning 'unlimited'.<sup>17</sup> They also appear in The Book of the Dead, and a colourful vignette shows the Ogdoad hoeing the earth on the primeval mound on the first day of creation (figure 3). (The two goddesses are pouring out the waters of Nun).<sup>18</sup> Allowing for the way in which real events rapidly become distorted with time and retelling, this is very evocative of Noah and his family setting up farming for the first time after the Flood, and may well be a memory handed down from Ham and Mizraim.

### Conclusion

The hope of the pharaoh for the afterlife involved being buried beneath the benben, to be reborn and see the first sunrise in the afterlife. Such thinking was futile. As believers in Jesus Christ (the True Light of the world), we are assured that we will rise with Him. After Jesus' burial He



**Figure 3.** The Ogdoad hoe, the primeval mound

conquered death; His tomb is empty, unlike those of the pharaohs. So next time you see the pyramids, remember the point—the benben—which may well be evidence of ideas handed down from Ham and Mizraim about creation and the Flood.

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16. Pinch, ref. 12, pp 172–173.

17. Pinch, ref. 12, pp. 175–177.

18. Silverman, ref. 4, p. 121.

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# A critique of scientism spoiled

**Can Science Explain Everything?**

John C. Lennox

The Good Book Company, UK, 2019

Lucien Tuinstra

Emeritus Professor of Mathematics at University of Oxford, John Lennox, is a renowned Christian apologist with numerous publications under his belt. He has debated prominent atheists like Richard Dawkins, the late Christopher Hitchens, and Peter Singer. Many will be familiar with his intellectual prowess and his explanatory abilities. His easy-going writing style is helpful in reaching the lay-skeptic whom this book is targeting. It is unfortunate, however, that Lennox promotes ‘old-earth’ compromise among evangelicals.

This latest book (a slim 127 pages) is by no means a unique work. It is reminiscent of the much larger volume, *I Don't Have Enough Faith to be an Atheist*.<sup>1</sup> What does make it different is the use of personal testimonies and anecdotes, plus witty comments.

The first anecdote sets the tone for the opening pages and the general view of theists held by ‘the world’: Lennox was challenged by university academics to “give up this childish faith in God” (p. 15). The polarization of science and religion (as if they are contradictory) is rife in society and needs tackling. Lennox explains that this is more an atheist versus theist (worldview) question, pointing out that in the 20<sup>th</sup> century “over 60% of Nobel Laureates were Christians” (p. 17). One Russian audience that he addressed was angered because

they had never before been told that the likes of Kepler, Boyle, Newton, Faraday, and many others were devout believers in God.

Western academics on the other hand seem glibly to overlook this. Of course creationists are all too familiar with being ignored. Stephen Hawking “read little philosophy and less theology” (p. 27), yet asserted: “There is no heaven or afterlife … that is a fairy story for people afraid of the dark.” Lennox countered with: “Atheism is a fairy story for people afraid of the light” (p. 30). The point is, scientists often venture out of their realm of expertise. This poses risks—as we shall see—as their followers are likely to lap up everything they proclaim, without due consideration and critical thinking.

## Big bang ‘science’ trumps biblical authority

Ten pages in the middle of the book contain most of its ‘controversial’ elements. Anticipating the skeptics, Lennox asks pointed questions. One such hypothetical criticism is worth quoting in full:

“Worse still, if you take what the Bible says about creation literally, don’t you end up believing that the earth is less than 10,000 years old, and so contradict everything we know from science about the age of the earth? There is therefore no point in bringing the Bible into the discussion if you want us to listen to you” (p. 65).

Note that even the biblically illiterate person understands the text to teach a creation *thousands* of years ago. Most Christians also understand this to be the plain meaning, but many then

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JOHN C. LENNOX

try to explain that we need to interpret the plain text differently. And certain Christian academics assure us that *they* are just the right (qualified) persons to do so. These people pay lip service to the authority of Scripture, but are really putting science above Scripture.

Recently, well-known apologist William Lane Craig has said farewell to inerrancy as an important doctrine, and has admitted he is only “reasonably confident” in the virgin birth of Jesus.<sup>2</sup> While he knows the traditional view of Genesis 1–3 is a literal understanding, he goes along with the ‘mytho-history’ explanation,<sup>3</sup> and Lennox is no different. When he says, “Here is how I resolve this particular issue” (p. 72), it implies that something is, in his mind, a problem. Yet, this issue only arises if uniformitarian ‘science’ is placed above Scripture, and Lennox has done just that when it comes to the age of the earth.

Lennox puts “information we get from studying nature” first and “that which we get from studying the Bible” second (p. 66). No surprise, then, that he is happy to admit that, when “the universe blinked into existence at a single point in time and space”, this “was a Big Bang caused by God” (p. 71).

Lennox does understand the sound arguments for a creation day being a 24-hour period.<sup>4,5</sup> However, in order to accommodate 13.8 billion years that supposedly lapsed since the Big Bang, he separates the first two verses in Genesis 1 from the six days of creation (Genesis 1:3–2:1),<sup>6</sup> which in turn are also separated from day 7 (Genesis 2:2–3). Quoting C. John Collins, he says that Genesis 1:1–2 describe “an event that took place before the storyline got going” (p. 73).<sup>7,8</sup>

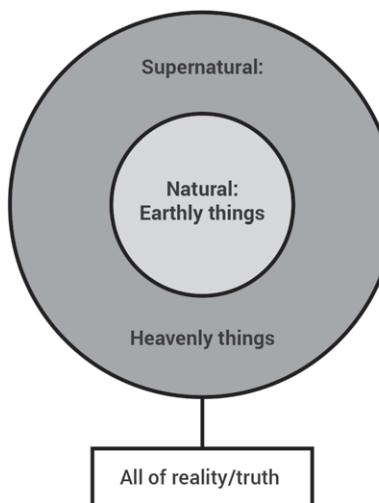
He claims to pay close attention to language and grammar, but fails to address the fact that the millions of years he accepts are filled with death, disease, and suffering—all prior to Adam, and thus before the original sin! Lennox says this sin “infected the human race from its very start” and “changed the attitude of the creature to their [sic] Creator, to other humans and to the creation around us” (p. 108).

But what about Romans 8:20–22? This passage speaks of the *whole* of creation, not just mankind.

When the Lord will make a new heaven and a new earth, it will be a restoration to the way things were originally (very good) and it will be done swiftly, not over billions of years. Theological integrity is paramount, if Christians are not to scupper the foundations of the Gospel of Jesus Christ, which is the danger of deep-time compromise.

### Naturalism

In the final third of the book, Lennox seeks to warn the reader to the supernatural, and Christianity in particular. Perhaps the greatest objection to the Christian faith—the problem of evil and suffering—is only addressed in just over a page! Maybe deep down, Lennox realises how unsolvable is the dilemma that, according to his understanding, there was already death, strife, and disease



**Figure 1.** All of reality includes the supernatural. Repeatable science resides in the natural, miracles (historical—e.g. creation, or future—e.g. a new heaven and a new earth) are supernatural (e.g. by the Creator).

(such as cancer) of both humans and animals *long* before the Fall.

A problem with this book is that, more than once, Lennox appeals to scientists to give justification or merit to Christianity and the Holy Scriptures (pp. 26, 76, 83). Fortunately, he does highlight the difference between the two types of science, which he refers to as *induction* (operational, empirical science; which includes natural science) and *abduction* (historical, forensic science; which is greatly enhanced by an eyewitness account) (figure 1).

If that eyewitness is none other than the Creator, one wonders why so many people “are not prepared to trust him” (p. 118) about creation in six days but prefer their interpretation of the book of Genesis. The biblical imperative is: “Trust in the Lord with all your heart, and do not lean on your own understanding” (Proverbs 3:5).

### Conclusion

There is much meat in this compact book, certainly enough to challenge the thinking atheist or agnostic, at whom this little volume is mainly targeted.

Christians may also refresh their memories on important matters such as the death of Jesus, His burial, the empty tomb and eyewitness accounts of the risen Christ, among other things. Despite Lennox’s efforts to minimize talking about origins, there are a few bones for the biblical creationist to spit out.

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# New textbook teaches non-Christian religion of theistic evolutionism

***Understanding Scientific Theories of Origins: Cosmology, geology, and biology in Christian perspective***

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IVP Academic, Downers Grove, IL, 2018

Lita Cosner

It is common for Bible colleges and seminaries to have special science classes for religion majors with names like “Christianity and science”. They cover scientific topics (e.g. origins) that are of interest to students who plan on specializing in theological study or pastoral ministry. Five Wheaton College faculty have teamed up to produce their own textbook geared toward this type of class. Out of the five, readers are most likely to be familiar with John Walton, Professor of Old Testament, and the author of many books that *Journal of Creation* has reviewed previously.<sup>1</sup>

The back leaf of the textbook promotes “BioLogos books on science and Christianity”. Anyone familiar with our previous refutations of BioLogos, and the various authors associated with them, will be familiar with our claim that their particular brand of theistic evolutionism amounts to evolutionary syncretism.<sup>2</sup> We’ve even made the blunt statement that “It’s not Christianity”.<sup>3</sup>

Expectedly, *Understanding Scientific Theories of Origins* promotes billions of years and evolutionary views of the origin of the earth and

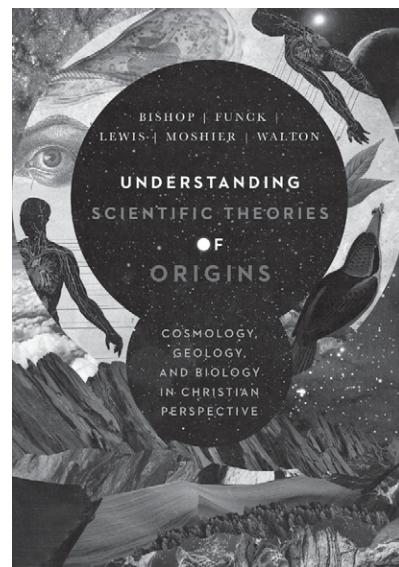
universe, the ancestry of humans, and the origin of death and evil. It is nothing short of theistic evolutionary propaganda, and where it isn’t in error, it’s misleadingly simplistic. One might forgive an introductory survey textbook for being simplistic, but in this case, it’s all leaning in one direction—toward evolution and away from any view which respects a plain reading of the biblical text. They do not even acknowledge that such a reading is possible.

## The problem of interpretation

The authors assert: “Even as we recognize the Bible as an authoritative document, the Bible’s claims can be understood only through interpretation” (p. 9). They present this as if it is a problem, but we can only understand *any* communication through interpretation. This is a central tenet of all scholarship. The authors presumably expect the reader of their textbook to interpret their writing, so clearly interpreting the Bible is not a shocking or difficult idea.

The authors also ignore the fact that nature does not speak in propositional statements. Instead, nature must *also* be interpreted. And scientific data are notoriously difficult to interpret. Across multiple areas of science, multiple studies are showing an inability to replicate scientific results.<sup>4</sup> In some cases, flipping a coin would be a more reliable way to determine scientific ‘truth’.

Sadly, Walton *et al.* have no confidence in our ability to interpret Scripture without their ‘enlightened’ guidance. They say that ancient people



had a very different way of thinking from modern people. For instance, regarding the differentiation between natural and miracle, they say:

“This distinction is found nowhere in Scripture. In the ANE no one thought in such categories. Moreover, the biblical authors think that God is involved in everything (e.g. Ps 104; Col 1:15–17). The natural/supernatural distinction developed much later, and people have imposed it on the Bible as they have tried to make sense of the events described in its pages and human experience” (p. 36).

Yet when one reads the Bible, we see that Mary and Joseph knew very well how children are conceived (Luke 1:34; Matthew 1:19), and Hezekiah knew the way a shadow normally proceeded across the steps (Isaiah 38:1–8), and even the widow in Elijah’s day knew that liquid normally has a constant volume while taking the shape of its container (1 Kings 17:7–16). The men of Malta knew that when a snake bites someone, he normally swells up and dies (Acts 28:1–6). Peter knew that men normally cannot walk on top of the water (Matthew 14:22–33). Moses knew that burning bushes are normally consumed (Exodus 3:3). Gideon knew that if there’s dew on the grass, there

would normally be dew on the fleece as well (Judges 6:36–40). Yet these poor benighted souls allegedly had no distinction between natural and supernatural!

The authors make much of this alleged inability of ancient people to understand concepts that, on face value, seem very scientific. They even make the ridiculous claim that “Biological and genetic ancestry are not concepts that exist for the biblical authors, so OT and NT claims about ancestry cannot be claims about biological or genetic ancestry” (p. 597). One wonders why Abraham minded that Eleazar was going to inherit his riches (Genesis 15:1–6) if he had no concept of biological ancestry, or why Sarah minded whether Ishmael was going to inherit alongside Isaac (Genesis 21:10)? Why did David have Uriah killed (2 Samuel 11), if Uriah would have had no concept about biological ancestry to object that his wife was carrying David’s child? Why did specifically Saul’s descendants have to die for his sin against the Gibeonites (2 Samuel 21)? The fact that five authors who are seeking to teach Bible interpretation to college students, and presumably editors and proofreaders, could not see the patent absurdity of this statement is downright concerning.

### Exegetical sleight of hand

One very common tactic of theistic evolutionists is to explain an interpretation using some long-age assumptions, and then *using those assumptions* rule out biblical creation. This is nothing short of eisegesis (reading into text something that is not there). For instance, the authors present the idea that God created the universe to have continuity, and then argue *based on this*, the idea of discontinuity introduced by the Fall is “biblically implausible”, despite the fact that the discontinuity imposed by the Fall is one of the central themes of Scripture (p. 56)!

Their strategic understatement of anything that would be inconvenient for their reinterpretation of Scripture gives a misleading impression of what the Bible teaches. Their statement about “The New Testament and the Flood” is worth quoting at length as an example:

“Only a few passages in the NT refer to the Flood, but none make a statement about its geographical scope. Luke 17:27 talks about how people were living their lives day by day and were caught by surprise when judgment came (compare with Mt 24:38–39). He notes that future judgment will likewise catch people unaware. Second Peter 2:5 references God sparing Noah, and 2 Peter 3:5–6 indicates that the world (*kosmos*, in its broadest sense, rather than a specific claim about the extent of the Flood) was deluged and destroyed. In light of this small number of references, we find that the NT offers little information to help us answer the scientific questions about the extent of the Flood. Furthermore, it should be noted that what the NT authors do with the Flood story is not

necessarily what Genesis does with the Flood story. Both interpretations are valid, but they need not take the same interpretive path. The account could have multiple significances” (p. 243).

This paragraph is an outrageous example of serpentine eisegesis. They omit important elements to cast the very point of these references into doubt. First, 1 Peter 3:20 clearly gives the *anthropological* scope of the Flood: “*eight persons*” were saved on the Ark. Peter thought the exact number of the survivors of the Flood was an important detail. If Peter accepted all the details he ever mentions, precisely which details do Walton and company think the apostle would have doubted? And in 2 Peter, when he uses the word *kosmos*, which suggests a worldwide extent, they intentionally obscure that. If Peter wanted to say that only the ‘inhabited world’ was wiped out, he could have used the perfectly good word *oikoumenē*, which Luke uses in 2:1 when he speaks of “all the world” being registered in the census.<sup>5</sup> Instead, if Peter wanted to indicate a *worldwide* flood, *kosmos* is exactly the word he should be using.



**Figure 1.** The textbook distorts the New Testament’s teaching about Noah’s Flood.

### **Ignorant critique of creation**

The authors also tend to describe young-earth creationists as one might expect an 18<sup>th</sup> century naturalist to describe the inhabitants of some far-off jungle. They certainly do not ever cite their works. The closest one ever gets to a fair treatment is when they describe a creationist belief from 40 years ago that every reputable biblical creationist ministry has since moved away from: they cite the second law of thermodynamics as ‘an effect of the Fall’ (p. 56), despite the fact that every mainstream biblical creationist ministry has rejected this nonsense and teaches that the second law operated before the Fall. They have a chart of the so-called conflicting details between Genesis 1 and 2 (p. 89), as if no one ever noticed this until the rise of uniformitarian geology. These can be easily answered.

### **Papering over scientific difficulties inherent in evolution and the big bang**

From experience, the textbook is utterly predictable. It espouses the latest theistic evolutionary philosophical and scientific explanations while ignoring the significant problems regarding the origin of life, historical Adam, the big bang, and other issues theistic evolutionists have to grapple with.

This book is especially regrettable in light of the fact that there is less reason today for compromise on these subjects. We have better arguments for creation and intelligent design (by the God of the Bible) than we ever had before. We have candid admissions by evolutionists that they don’t know how the complex code of DNA arose, or how life could come from non-life. As mentioned above, there is a reproducibility problem in science serious enough to call *most* scientific findings into question, let alone the shakiest studies with the

most questionable claims of being real science.

### **Scary consequences of compromise**

There are places where the mask slips off, so to speak, and we are faced with the grim consequences of the compromise suggested by Walton *et al.* For instance:

“If there is no significant prefall/postfall rapture, then it is hard to escape the conclusion that death and disease are part of the normal functioning of the creation in Genesis 1, which, according to the doctrine of creation was incomplete, not yet the new creation it is intended to be. Of course, many Christians believe that the Bible teaches there was no biological death or disease in the prefall creation because prefall everything was ‘perfect.’ Here Greek philosophical notions of perfection are strongly at work” (p. 57).

This destroys the entire Creation/Fall/Redemption narrative of Scripture. If the God of Genesis 1 considered death and disease ‘very good’, then what was Jesus coming to redeem us from, and what exactly were the effects of Adam’s sin?

### **The Bible is true, but says nothing about the real world**

Walton *et al.* appeal to the fallacious ‘two books’ argument, that natural revelation (i.e. science) and special revelation (i.e. the Bible) tell us about fundamentally different elements of reality. For instance, they say that science focuses on physical questions like the mass and temperature of the sun. They say theology addresses questions of value, such as “what is the meaning of the Sun?” (p. 92). However, this is just another version of the failed ‘non-overlapping magisteria’ argument. When we realize that Scripture addresses *historical* questions, such as the formative history

of the sun (Genesis 1:14–19), it is clear that the ‘two books’ argument does not resolve the problems with theistic evolution.

### **Theistic evolutionism is a non-Christian religion**

Both Mormons and Jehovah’s Witnesses claim to believe in a Christ, claim to believe in a God or gods, and use the Christian Scriptures. Yet we reject their claim to Christianity because they deny doctrines such as the Trinity and the deity of Christ which are central to Christianity. Non-trinitarian Christianity ceases to be Christianity at all. Yet from the first verse of the Bible, God’s most consistent self-identification, that which differentiates Himself from every other being, is that He alone is the uncreated Creator of all that exists. Theistic evolutionism pretends to retain this belief while interpreting this creative act so differently as to deny what God explicitly claims for Himself in His word.

Wheaton is a respected Christian seminary, and among the five authors Walton is a well-known and respected professor. Yet, this textbook is simply dangerous. It will likely be used in many ‘Christianity and science’ college courses specifically tailored for future pastors, to their detriment. Parents of students at Wheaton, as well as alumni from a time when Wheaton may have actually been Christian, should note this with interest and concern.

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# Ancient context to enduring doubt

***Old Testament Theology for Christians: From ancient context to enduring belief***

John H. Walton

IVP Academic, Downers Grove, IL, 2017

Murray R. Adamthwaite

I begin with a confession: I have found preparing a review of this book an altogether depressing and distasteful process. It is on one hand so full of concessions to liberal and secular scholarship, yet comes from one who on the other hand claims to be a Bible-believing evangelical, a claim that rings hollow on a detailed examination.

Walton's basic position is that the Old Testament was written *for* us, but not written *to* us, since its authors spoke classical Hebrew and not any modern language, and more importantly, they spoke from within a particular cultural framework which is alien to our own (p. 5; emphasis in original). He is insistent on this point throughout, as in this assertion towards the close of the book:

“Since the Old Testament *is* an ancient text written to another culture, it is possible, if not likely that we will misunderstand some of what is going on as we navigate ancient language and culture [emphasis in original]” (p. 269).

Hence to understand it properly we need to ‘think into’ and understand the cultural background of the Ancient Near East (ANE) and extract its message from that background and framework (pp. 14–18). While this sort of perspective has become quite

fashionable, even standard, in our post-modern times, it needs to be challenged, for a number of reasons, as outlined below.

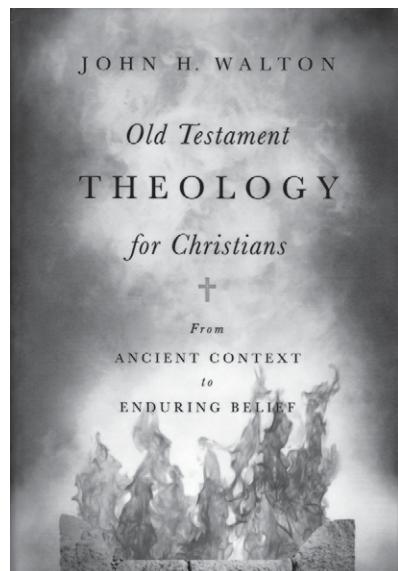
However, to make good on this claim, Walton’s thesis on Old Testament theology is that the ancient Near Eastern literature is essential to understanding that theology, such that without it we misunderstand the latter. He states this clearly:

“... I believe that the Old Testament cannot properly be understood without taking the ancient Near Eastern cognitive environment into account. The Israelites were embedded in the ancient world, and they thought like ancient people” (p. 15).

This statement is fully in line with his parallel series of books, under the general theme of “The Lost World”, in which he insists that the ANE literature provides the key to understanding the relevant biblical narratives.<sup>1</sup> Moreover, Walton insists that it is no excuse to point to Christians of the past who had no access to the ancient Near Eastern literature. On the contrary, we must utilize the tools now available, and resist the temptation to read the Old Testament only in the light of the New Testament. We must see through the lenses of the ancient Israelites, and not our own.

To reinforce this point, Walton uses the metaphor of a ‘cultural river’ (p. 74), which flowed through all the various cultures, including Israel. These Israelite intermediaries for divine revelation, to whom we often refer as ‘the authors’, were “fully immersed in the cultural river” (p. 75), and the hearers were likewise immersed.

However, so that he may not be misunderstood (or perhaps to allay



fears for his professed orthodoxy on the part of his evangelical readers), Walton does not affirm that all interpretations of the Old Testament prior to our access to ancient Near Eastern texts were flawed, but he points out that the Church Fathers and the Reformers were not trying to discover authorial intent, nor trying to compile a theology of the Old Testament (pp. 16–17). However, that said, Walton goes on to decry attempts to “universalise” the Bible’s theology and ethics, and insists that by contrast we must understand that it speaks in the language of accommodation to a culturally “cognitive environment”, i.e. the ancient target audience. Hence it cannot be universalised *simpliciter*.

Accordingly, while he occasionally cites some conservative scholars such as W.C. Kaiser, for the most part the scholars he quotes with approval and relies on are definitely from the liberal-secular side of ancient Near Eastern studies. This is as it must be, he insists, since it is to the literature of the ANE that we must go in order to understand the Old Testament, and it is the secular critics who in the main are conversant with this literature. By contrast, there can be no going back to the studies of

Old Testament theology prior to the discovery of this body of texts.

At the outset, Walton helpfully lists his basic assumptions before he sets out on his theological quest (pp. 3–13). These can be summarised as follows:

- Interpretation that is authority-based, on one hand seeing the Bible as God's authoritative revelation, but at the same time presenting us with the “complicated endeavour” of discerning just what that authoritative message is (p. 3).
- Recognizing the ancient context of the audience to which God spoke: “We are not in the implied audience of the human author” (p. 5), so we must understand the ancient context as best we can, so as to avoid reading our modern thinking into the text.
- A consistent and sustained “theological impulse” must attend interpretation. This applies to all literary genres in the Old Testament: the goal is always theological.
- The centre and goal of the Old Testament revelation is God's presence among His people and their relationship with Him. This sounds good until we read on and find that he downplays emphasis on personal salvation; rather, he seeks a broader ‘cosmic’ perspective (p. 8).

However, unhelpfully, he has omitted to state certain vital presuppositions:

- As much a claim as an assumption is the constant assertion of “how an ancient Israelite would understand X” or “the questions an ancient Israelite would ask”—neither of which in his view correspond to the (mistaken) understanding of the average, well-informed Christian as he reads the Old Testament. One finds this constantly throughout the book, as for example with this assertion regarding Genesis 1:26 and a divine council: “this conclusion suggests that Genesis 1:26 not only would have been understood to refer to the council (not the Trinity) by the Israelite audience, but also that it is theologically unsubstantiated to

impose a Trinitarian interpretation ...” (p. 42).

- But how does he know that the Israelites would have understood the text in this way? How does he know how the Israelite mind worked? Has he been back in a time machine to interview “an ancient Israelite” hearer? While this type of claim is all too familiar from scholars of the liberal-critical outlook, it still remains that mere assertion is in no sense proof.
- Another oft-repeated assumption is that the ANE literature provides the key for unlocking the meaning of the Old Testament, i.e. that this material reveals the “lost world” of the Old Testament.

However, one gets the impression here, from Walton's discussion, that these texts from the ANE are of fairly recent discovery. I'm sure he does not believe this—but the bold claim that he is now revealing “the lost world” of the Old Testament does create that perception. In reality, it is about 150 years ago that the *Gilgamesh Epic* was first discovered and translated, and likewise *Enuma Elish*, the alleged Babylonian creation story, in which Marduk emerges victorious from a bloodthirsty war, and receives fifty adulatory names (cf. figure 1), came to light at about the same time. While other texts are of somewhat more recent publication, many of the texts he cites have been around for at least a hundred years, as one can gather, e.g. from Heidel's *The Babylonian Genesis* (1951) or Pritchard's *Ancient Near Eastern Texts* (1969). So there is nothing essentially new about their availability. Meanwhile, many Old Testament theologies by conservative authors have appeared, but Walton appears to disregard them.<sup>2</sup>

### Intended recipients

The first point of response to these various claims, in particular in regard to Scripture being written “not to us,

but for us”, this could equally be said of the New Testament: the apostles too wrote to their own readers and generation, even if secondarily they wrote for us, but that their message must likewise be extracted from its ‘cultural environment’ and background, that its theology and ethics must not be universalised, etc. Is he prepared to go this far? It is quite evident that many others of the post-modern outlook do indeed reach that conclusion, but in so doing they part company with any sort of Reformation affirmation of the plenary, God-given inspiration of Scripture, the supreme and transcendent authority of Scripture, and most importantly in the present context, the perspicuity or clarity of Scripture, along with the principle of *Scriptura Scripturae interpres*: “Scripture (itself) interprets Scripture”. In this respect Walton appears to want to have his cake and eat it too.

Secondly, if we must recognise that the Old Testament can only be understood by taking into account the ‘cognitive environment’ of the ANE, who is to extract the message of Scripture from its ancient Near Eastern cultural background and framework? Why, the scholars of course, especially those with skills in the field of ancient Near Eastern studies, who are able to guide us through the ‘complicated endeavour’ of finding the authoritative message. So, in effect, we have a new *magisterium*, not of an ecclesiastical hierarchy this time, but of academics. Where does this leave the ordinary Christian? Here Walton seems rather disdainful of “popular evangelical piety”, with its individualistic piety and simplistic understanding of Scripture (p. 69), and thus rather skeptical of its ability to discern the real message of the Old Testament.

Thirdly, the apostolic testimony as to the intended audience of the Bible's message and instruction would appear

to contradict Walton. Consider the following examples:

“... my Gospel and the preaching of Jesus Christ, according to the revelation of *the mystery which has been kept secret for long ages past*, but now is manifested, and by the Scriptures of the prophets, according to the commandment of the eternal God, has been *made known to all the nations*, leading to the obedience of faith [emphases added]” (Romans 16:25–26).

“Now these things happened to them [the Israelites in the wilderness] as an example, and *they were written for our instruction*, upon whom the ends of the ages have come [emphases added]” (1 Corinthians 10:11).

“As to this salvation, the prophets who prophesied of the grace that would come to you made careful searches and inquiries . . . It was revealed to them that *they were not serving themselves, but you*, in these things which have been announced to you through those who preached the Gospel to you by the Holy Spirit sent from heaven [emphases added] . . .” (1 Peter 1:10–12).

In the first of these passages Paul declares that the Gospel was hidden from the people during Old Testament times, that its message was indeed obscure, i.e. a mystery; but a new era has now arrived such that the Gospel of Christ is now revealed—from the OT Scriptures—and published to the nations at large. Hence the intended audience for the Old Testament message was not so much for the prophets’ contemporaries in their cultural environment, but for the Gentile recipients of Gospel in this Messianic age.

In the second passage Paul recounts incidents in the wilderness wanderings and presses home for his Gentile audience the moral implications of these incidents; that they were written for their instruction in this Gospel era.

The passage from 1 Peter is particularly apposite: the prophets



**Figure 1.** Hymn to Marduk, the patron deity of Babylon, who emerges from the conflict described in the Enuma Elish myth

inquired and searched regarding the Gospel of grace, and (contrary to Walton) he insists that they were not serving themselves—or presumably their contemporaries—but Peter’s Christian readers in the Gospel age! Thus the prophetic message is to be discerned from the Spirit-directed preachers of the Gospel (the Apostles in particular), and by the Holy Spirit who gave the Scriptures in the first place, and who interprets them in turn to the humble believer (2 Peter 1:20–21). Whatever relevance the ‘cultural context’ and background may have, if they serve any purpose, they are secondary to the Spirit-given Gospel message contained in the Torah, the Prophets, and the Psalms (Luke 24:44). Significantly, Walton does not discuss any of these texts in his assertion of ‘intended audience’.

In summary at this juncture, despite his claims to an evangelical commitment (p. 9), Walton’s constant emphasis—especially in his insistence on the relevance of the Near Eastern background—is on the human character and dimension of the Bible, and its symbiosis and concomitance with the milieu of the ANE. Meanwhile, its character as God’s Word, which transcends time and culture, tends to be lost in the miasma of cultural background, the time-bound authorial intent, and the motifs and themes of

ancient Near Eastern texts. Contrary to Walton, the primary character of the Bible is that it is God’s Word, and as such it addresses every reader directly in every age, culture, and place. I might add, regarding Walton’s outlook, that we have heard all this before, i.e. from liberal-secular scholars who had no commitment to the divine origin of the Old Testament, still less to its Christ-centred message.

Here our Lord’s post-resurrection ministry comes in, wherein He opened the apostles’ minds “to understand the Scriptures” (Luke 24:45). We can be sure that in this connection He did not acquaint them with Near Eastern mythology or Mesopotamian literature! Indeed, the use we observe being made of the Old Testament in the writings of Paul and the Catholic epistles we can legitimately trace back to our Lord’s ministry in general, but to His post-resurrection ministry in particular.

### Walton’s handling of the ancient Near Eastern texts

Moving on from strictly biblical and theological issues, we must inquire as to how reliable is Walton’s use of the ancient Near Eastern literature. For one who insists on its importance, and relies on those texts so heavily, one would expect that his understanding and interpretation of these texts would be on the mark. However, this is not the case, as can be seen from the following examples:

1. In regard to monotheism, in his discussion of “I AM who I AM” (Exodus 3:14), he not only denies that this asserts God’s eternal self-existence, but appeals to an Egyptian text to deny its uniqueness (p. 49). However, in so doing he cites a secondary source for the text,<sup>3</sup> and not the text itself so that one can ascertain the context. It is in fact a magical text, and the relevant lines appear as part of a spell to be recited over the picture of a cow, while the

- arrangement of Re and his son Shu are precisely described.<sup>4</sup> The relevant line reads: “I am who I am, and I will not let them take action [i.e. foment a rebellion]”, that is Re (if the reference is to him, as seems likely) is simply declaring that he remains himself and is determined that he will act at the present just as he has done in the past.<sup>5</sup> Hence, contrary to Walton, this line has nothing to do with the Exodus declaration; he has rushed to a conclusion. Thus the burning bush declaration is indeed unique.
2. Another egregious misconception concerns human origins and the image of God in man, as in Genesis 1:26–7; 2:7. Walton contends that the ancients were not interested in material origins but human identity (p. 92), and cites in this connection the depiction of the Egyptian god Khnum crafting a child (actually Amenhotep III) on a potter’s wheel, along with his *ka*’ (*k<sub>3</sub>*) or spirit-double (figure 2).<sup>6</sup> He alleges: “Biological origins are not in view; identity is what is considered important” (p. 93).<sup>7</sup>

But surely the Khnum painting expresses *both* the physical origin and that of the spiritual double, the *ka*'. Add to this the fact that the physical was conceived of as essential to the identity of the person, as evidenced by the need for mummification after death and the consequent preservation of the body, plus the continual food offerings (*ka'u*, the plural of *ka*') for the *ka*' of the deceased. Walton proposes a false contrast. Moreover, can such an esoteric conclusion seriously be drawn from a simple painting in an Egyptian tomb?

Walton’s comment on kingship in the Ancient Near East likewise betrays a sweeping generalisation, all too familiar in critical literature: “In the rhetoric of the ancient Near East, kings regularly identified themselves as the sons of one god or another” (p. 232). Then he relates this conclusion to the royal psalms (Psalms 2; 110), and also

to Jesus’ identification as Son of God, that it is “far removed from the idea of God incarnate”.

But his observation on royal ideology is not at all correct. The term “son of god” was not a widespread title for a king or a concept of kingship in the Ancient Near East. In Egypt it was indeed part of both the titulary and the royal ideology of the king, and did identify him as the sun deity Re (*sa Re*, the fifth name of the royal titulary), but that was not the case elsewhere. In Mesopotamia the king was the vice-regent of the national deity, e.g. of Aššur in Assyria, whom the king regularly referred to as “my lord” (*bēliya*), but he was not “son of Aššur” or of any other god. In the standard royal titulary which prefaces the royal annals there are many epithets, but “son of god X” is not one of them. The king was not divine.

Then in the Hittite treaties the king introduces himself as “the Great King, King of Hatti, Hero, Beloved of Tešub”, but not “son of god X”.<sup>8</sup> Moreover, the king was under the jurisdiction of the *panku* or council of state. Far from being an absolute monarch, as in Egypt or in Mesopotamia, the role of the *panku* was to confirm according to a formula of succession the accession and legitimacy of the king. Legitimacy was always an issue, but it became acute in the case of Hattušili III, when he seized the throne from his nephew Urhi-Tešub, such that Hattušili found it necessary to issue an apology to declare his legitimacy to the palace officials.<sup>9</sup>

In the light of this Near Eastern background, the declaration of the Lord to His anointed, “You are my Son; today I have begotten you” (Psalm 2:7), is not a mere honorific title, on a level with kings of the ANE. Since the historical books give no hint that the Israelite king was invested with this title at his coronation, we are left with Psalm 2:7, which must then

be interpreted that way. But if then that interpretation is used as evidence we have circular reasoning, which Walton apparently adopts. Likewise, Jesus’ adoption of the attribute “Son of God” is indeed a metaphysical claim, and not merely an honorific title. His Jewish opponents saw this clearly, as John 5:18 and John 10:33–36 testify.

On the subject of Israelite monotheism, Walton appeals *inter alia* to an Egyptian hymn to Amun-Re to deny that the *šema'* of Deuteronomy 6:4 is any sort of metaphysical statement that only Yahweh exists (p. 36). Here again we encounter the claim as to how an Israelite would have understood the statement. It is certainly not how Jewish exegetes have understood what is for them a confession of faith. Hence Walton would criticize not only Christians but Jews also for their misunderstanding of the *šema'*.

In summary, Walton sees a basic continuum between Yahweh and the gods of the ANE, with a few spikes of uniqueness and contrast here and there. With this estimate he sides very much with the secular, critical scholars who come to a similar conclusion. However, to arrive at this conclusion he misreads the Near Eastern texts, and empties the biblical references of their profound theological content.

## Creation and Genesis 1

Although this topic receives relatively little treatment in his volume, he sides with those interpreters who deny that Genesis 1:1 explicitly teaches or implies a creation *ex nihilo*, “out of nothing” (p. 10). Moreover, he alleges that only in modern times has the doctrine of *ex nihilo* been applied to the material cosmos, the implication being (apparently) that this application is something of an innovation, as it originally applied to discussion about the origin of the soul. While space forbids a full investigation of this allegation, it is evident that Walton has erred again. Tertullian in *Against*

*Hermogenes*, xx and xxi, affirms about creation that God made all things from nothing, that no previous matter existed prior to God's creation—and he is talking there about the material universe, not the human soul.<sup>10</sup>

For Walton, scientific questions are “a distraction” (p. 27). Not only is he not interested in a harmony of Genesis and science, and certainly not from a creationist perspective, but any such quest is for him a sidetrack from a proper understanding of Genesis. The proper understanding of Genesis 1 he sees as “God ordering the cosmos to serve as sacred space where he can be in relationship to his creatures”, and where Eden is the centre of his place of rest. From this rather oblique statement it would be easy to conclude that God somehow needed the creation, and man in particular, to complete his own happiness. If this is his meaning it is certainly not the case: God never needed the creation for any purpose, but it was a free expression of His own will and good pleasure.

Then when it comes to the image of God in man, Walton dissociates himself from any traditional understanding, and opts for a ‘corporate’ interpretation. “The image is a status, not a set of

capabilities” (p. 87) and “none of us individually is the image of God; we are all part of corporate humanity, which is the image of God” (p. 88). With this corporate status one can choose to identify—or not (p. 86), but the status remains. Walton then blithely assumes that this corporate aspect is re-affirmed in Genesis 5:1–3, whereas the text surely teaches that just as Adam (the individual) was created in the likeness of God, so Adam begat another individual, Seth, in his own likeness (Genesis 5:3). Hence the image was transmitted from father to son, and so on. Further, God ordains the death penalty for murder in the Noahic Covenant (Genesis 9:5–6), precisely because the murdered *individual* bore the image of God. Moreover, Walton does not discuss the renewal of the image of God through the redemption of Christ in Ephesians 4:22–24. This ‘putting off’ is the task of the individual Christian.

### Eschatology

In regard to life beyond the grave, or what theologians call the intermediate state, Walton rejects any

view that this is part of Old Testament teaching. While space forbids a full account of his discussion, I can mention that Psalm 49:15 (“You will ransom me from the power of Sheol, for you will receive me”) and Psalm 73:24 (“You will afterward receive me to glory”) are rejected as holding out hope for the life beyond (pp. 248–249). Moreover, Jesus’ refutation of the Sadducees (Matt 22:31–32 and parallels) by appealing to the present tense of the verb “to be” in Exodus 3:6, i.e. that God *is*—not *was*—the God of Abraham, Isaac, and Jacob, is similarly ignored.

What is far-fetched is his view of Elijah’s translation in 2 Kings 2:11–12 (pp. 249–50). Because the Hebrew *šāmayim* can mean simply ‘sky’ he concludes that Elijah simply went into the sky, and not into heaven (about which, on his view, the Old Testament says nothing). To the inevitable question, “Who then appeared on the mount of Transfiguration?” Walton does not even mention the passages in the Gospels (Matthew 17:3–4; Mark 9:4–5; Luke 9:30–33), let alone explain them.

As a footnote, I have heard this kind of ‘explanation’ of Elijah’s translation from those sects which deny the heavenly intermediate state and assert soul-sleep after death: Elijah went into the sky and came down again at some undisclosed location! Walton appears to align with these groups. While this is not itself a refutation, such a position, apart from his decidedly liberal leanings otherwise, takes him out of the arena of orthodox Christianity and into the realm of sectarian heterodoxy.

A scholar just as skilled in ancient Near Eastern texts as Walton claims to be was Alexander Heidel, who gave a very different assessment of the Old Testament’s view of the afterlife—compared with the Near Eastern material—in his *Gilgamesh Epic and Old Testament Parallels*, in the chapter entitled, “Death and the



**Figure 2.**The Egyptian god Khnum crafting a child on a potter's wheel, while the goddess Heqat imparts life via the ankh-symbol

Afterlife".<sup>11</sup> Heidel's discussion has never been bettered, yet Walton simply ignores it without even a mention.<sup>12</sup> Likewise, Walter Kaiser's albeit brief discussion,<sup>13</sup> or the more extensive discussions by Geerhardus Vos,<sup>14</sup> and J.B. Payne,<sup>15</sup> are similarly bypassed.

The final point of this review concerns resurrection. In brief, Walton has difficulty acknowledging that the Old Testament envisages a resurrection of the bodies of individuals from dust, to an afterlife. The classic texts such as Isaiah 26:19 and Daniel 12:2 are interpreted otherwise: the former as a national resurrection, "much like Ezek 37"; and the latter as indeterminate and difficult to define, in the light of the differing views among Jewish groups (pp. 253–55). He concludes, "The Israelite doctrine should not be equated with the doctrine eventually formulated in New Testament theology and church history" (p. 255). However, Jesus' clear allusion to the Daniel text in John 5:28–29 clearly indicates that He understood it as referring to the resurrection of individuals in their bodies, from 'the tombs', at the last Day. Walton is unwilling to affirm what Jesus affirmed.

## Conclusions

1. In respect of the Ancient Near Eastern literature, on which he places so much store, he reveals what can only be described as sloppy scholarship. I have given a few examples; more could be produced. This does not inspire confidence in his hermeneutics or exegesis of the Old Testament itself.
2. In his effort to dissociate himself from traditional understandings of Old Testament themes Walton employs abstract philosophical categories such as identity, relationship, community, functionality, sacred space, and the like. Then, having explored such themes in the Ancient Near Eastern literature he proceeds

to claim that "the Israelite understanding" was similar, albeit with some differences. This wafty, philosophical air is, contrary to Walton, foreign to biblical expression.

3. Walton sums up with a series of denials of what Old Testament teaching is (pp. 289–91), which should warn the devout Christian reader who handles this book. In view of these many denials, and the above elucidation, this is a highly dangerous book, not least because it professes to sit within the evangelical, Bible-believing context when in fact it does not. All Walton's affinities are with those of the liberal, secular outlook, while his affirmations of orthodoxy are often oblique and ambiguous. At best, his trumpet gives an uncertain sound.
4. With his insistence that we cannot read New Testament themes back into the Old Testament, he certainly rejects the maxim attributed to Augustine: "In the Old is the New concealed; in the New is the Old revealed." In short, with all his denials of what Christians from earliest times have found so precious in the Old Testament, one wonders what ultimate value the Old Testament is then supposed to still have.

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7. In the "Instruction to Merikare" it is said of Re, "He made breath for their noses to live, they are his images (*snnw*), who came from his body (*h wj*)."<sup>16</sup> Thus we have man coming from the flesh of a god, a motif similar (to some extent) to that in Mesopotamia, where man is manufactured from the blood of a slain god, duly mixed with clay. For the text of Merikare see Lichtheim, M., *Ancient Egyptian Literature*, vol. I, University of California, Berkeley, p.106,1975; For discussion see Hoffmeier, J.K., Thoughts on Genesis 1 & 2 and Egyptian Cosmology, *J. Ancient Near Eastern Society* 15:47, 1983.
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# The conversation that never happened

**Richard Dawkins, C.S. Lewis and the Meaning of Life**

Alister McGrath

SPCK Publishing, London 2019

Thomas Fretwell

What would happen if you pitted two Oxford dons against each other in dialogue and debate, one being a scientific populariser and celebrity atheist (Richard Dawkins) and the other a classical literary scholar and Christian apologist (C.S. Lewis)? What would the conversation look like, and what could we learn from such an interplay of ideas? Well, in this book, fellow Oxford scholar Alister McGrath seeks to answer these questions by imagining this exchange “of ideas that sadly never happened” (p. 1).

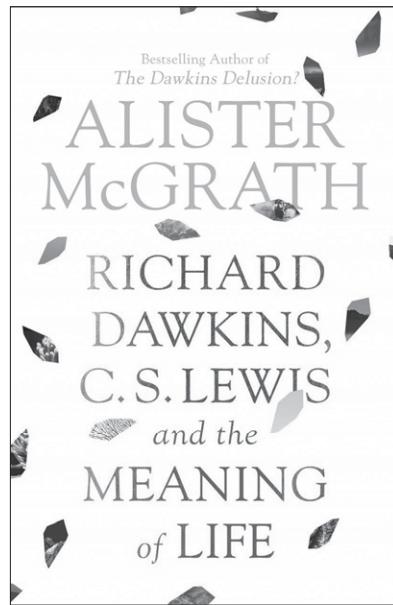
McGrath is well positioned to be our guide in this imaginary conversation; he holds three doctorates from Oxford University (molecular biology, systematic theology, and science/religion) and is currently the Andreas Idreos Professor of Science and Religion at the University. In addition, he has written extensively about Richard Dawkins, addressing the more scientific questions in *Dawkins' God: From the selfish gene to the god delusion* (2015),<sup>1</sup> and tackling the more philosophical issues in his bestselling response to Dawkins' *The God Delusion* (co-authored with his wife, Joanna C. McGrath), *The Dawkins Delusion: Atheist fundamentalism and the denial of the divine* (2007). He is also a Lewis scholar, having written the recent biography, *C.S. Lewis: A life: eccentric genius, reluctant prophet* (2013).

The format of the book is fairly straightforward and consistent throughout. It is structured around only four chapters, each engaging one of the big questions of life: 1) Big Pictures: why meaning matters, 2) Reasoned Belief: faith, proof and evidence, 3) Is there a God? and 4) Human Nature: who are we? Each consists of a brief overview of Dawkins' beliefs on the topic, then a section on Lewis's beliefs, before McGrath concludes with his own reflections.

## Expectations vs reality

Initially I was excited at the prospect of listening in to this imaginary conversation. Surely those interested in Christian apologetics will be well aware of the nature of some of Richard Dawkins' anti-theistic tirades and will have wondered how he would fare against the man who wrote the book on Christian apologetics, *Mere Christianity*. Was a fascinating interplay of theology, philosophy, and science about to take place? My initial enthusiasm was tempered somewhat when the actual book arrived, a slender volume totalling only 80 pages, so clearly the book was really only meant to serve as an introduction to the topics, to “stimulate my readers to explore them further” (p. 2). However, nowhere is it recommended where to continue this exploration—presumably the publisher intends readers to move on to McGrath's other books on these topics.

Knowing that neither Lewis (1898–1963), Dawkins, nor McGrath hold to a biblical view on creation, I wasn't expecting too much in this area. In fact, the actual topic of creation was wholly absent from the book; even the chapter on humanity failed to address the issue. Given the author's



theistic evolutionary views, this is not surprising.

For a book written by a respected academic theologian, portraying a leading twentieth-century Christian apologist against one of today's most famous atheists, one might be expecting to encounter some deep theological reasoning undergirded by Scripture, but within the entire volume only a couple of scriptural references are to be found.

## Listening to the conversation

Nevertheless, the book does provide some insightful comments. There is much to agree with in the book's overall critique of the materialist worldview and the universal Darwinism espoused by Dawkins. In chapter one, McGrath sketches out Dawkins' worldview, saying, “Dawkins sees in Darwinism a framework that offers a superior explanation of our universe compared to its potential rivals” and that, to Dawkins, “Darwin provided the magnificently powerful alternative to design” (p. 5). McGrath correctly explains that a “scientific theory or a worldview” must be judged by how well it explains reality and makes sense of things:

“Yet Darwinism doesn’t—and can’t—explain everything” (p. 5).

Thus, many of the big questions of life lie beyond the scope of Richard Dawkins’ universal Darwinism, and scientific investigation is not the sole arbiter in determining truth. In contrast to this, McGrath, in the place of C.S. Lewis, recounts that his own conversion from atheism to Christian theism was precisely because he saw Christianity as having much more explanatory power in describing the reality that we live with. Lewis himself saw God “as both the rationality of the world, and the one who enables us to grasp that rationality” (p. 9). Lewis’ worldview, the rationality of accepting things on the basis of their explanatory power, is set out in one of his best-known, oft-quoted statements:

“I believe in Christianity as I believe that the Sun has risen, not only because I see it but because by it I see everything else” (p. 10).

### Faith, proof, and evidence

Many readers would likely consider the conversation in chapter two, “Reasoned Belief”, to be vitally important. However, the overwhelmingly different styles of Lewis and Dawkins left the conversation a little shallow and the treatment too cursory for the reader to fully grasp what C.S. Lewis actually believed. McGrath outlines the way that “Lewis’s apologetic approach generally takes the form of identifying a common human observation … and then showing how it fits, naturally, plausibly, within a Christian way of looking at things” (p. 18). He shows how Lewis often invited people to view things in an alternative (albeit Christian) way and raises the objection that “surely we ought to ask what evidence might lead us to adopt those beliefs in the first place, rather than simply taking them as given” (p. 19).

The interaction with Dawkins on this point is more substantial. Dawkins is suspicious of religious beliefs precisely

because he claims they involve a retreat from evidence-based reasoning. He sees religious faith as “blind trust, in the absence of evidence, even in the teeth of evidence” (p. 21). For him, people should look to *science*, for, “science is about what can be proved to be true on the basis of evidence” (p. 22). McGrath raises doubts about Dawkins’ scientism:

“Scientists regularly have to confront the problem of the ‘underdetermination’ of theory by evidence” (p. 22).

Simply stated, the evidence is often not conclusive enough to prefer one theory over another, as both can have some evidential support. The discussion at this point failed to highlight the role that worldview presuppositions play when people interpret evidence—the so-called ‘science’ of origins discussions is rarely a neutral endeavour, since the scientists themselves interpret things through their own particular worldviews.

In his reflections on the content of this chapter, McGrath successfully points out one of the glaring hypocrisies of Dawkins’ methodology, stating that he:

“… sets out rational and evidential criteria by which he chastises religious beliefs. So why does he not apply those same criteria to his own belief? This remarkable rational asymmetry represents a significant vulnerability within the New Atheist movement as a whole” (p. 28).

Dawkins says faith is a “process of non-thinking”; that it is “evil precisely because it requires no justification and brooks no argument” (p. 29). However, McGrath, having written entire volumes on Dawkins’ opinions, feels no need to repeat himself and quickly dismisses this nonsense—and in the process produces this great one-liner:

“I cannot help but feel that Dawkins really ought to read more Christian writers before making such muddled overstatements about

something he doesn’t understand” (p. 29).

### Is there a God?

This brief chapter, one would have thought, should have been the crux of what divides the two men in this imagined conversation. However, it seemed to be over almost as soon as it had begun. Dawkins is blunt, stating that “no good reason can be given for believing in God. It is irrational for a modern person to believe in God” (p. 32). Lewis, though, does not typically approach the question of God’s existence by providing evidential support, but by seeing it as getting someone to step into the story. Although he does present the moral argument particularly lucidly in *Mere Christianity*, it is a shame that McGrath doesn’t introduce that into the discussion here. McGrath says that “he does not establish the existence of God by evidence-based reasoning” (p. 37). These seemingly antithetical approaches meant that the two men seemed to be talking past each other and not *to* each other—perhaps a drawback of an imaginary dialogue of this sort.

### Human nature: who are we?

An important corollary to the question posed by the final chapter is, ‘Where did we come from?’ Yet, unfortunately, nowhere is the creation of man in the image of God mentioned—nor is the concept of biological evolution really challenged. Instead, the focus is on Dawkins’ idea of the selfish gene, which depicts “human beings as accidental and unintended outcomes of a blind process, whose lives are influenced by genetic forces we do not fully understand” (p. 45). Dawkins argues that we are shaped and conditioned by our genes, and they may instruct us to be selfish—but that we are under no obligation to obey them: “the future of humanity depends on our resisting this

genetic legacy, not going along with it” (p. 47). McGrath rightly points out, as others have done since *The Selfish Gene* was published, that this idea of mankind overcoming this genetic determinism seems to be “subverted by the arguments that precede it”; i.e. it is self-contradictory to suppose that we should use our ‘will’ or autonomy to overcome the evolutionary process that bound us in the first place.

The contribution of Lewis to this conversation is especially brief but he correctly says that:

“... a purely materialistic account of human nature ends up reducing our deepest beliefs and aspirations to the outcomes of chemical or electrical events in the human cortex” (p. 49).

Lewis rejected the assertion that scientifically reductive accounts of human nature were sufficient in explaining who we are, while allowing that they might “help us understand aspects of human functionality” (p. 49).<sup>2</sup> This, however, is as far as the interaction goes between C.S. Lewis and Richard Dawkins on this subject.

### Conclusion

As McGrath states in his summation, “this short book can only begin to open up these questions”, and that is certainly all it does. The book may whet some readers’ appetites to delve deeper into the issues and questions raised. However, the imagined conversation between Lewis and Dawkins really amounts to nothing more than the briefest of introductions to their thoughts on some of the big questions of life.

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# Academia and the press as the bad guys

### *Spectacle: The astonishing life of Ota Benga*

Pamela Newkirk

Amistad, New York, 2015

Jerry Bergman

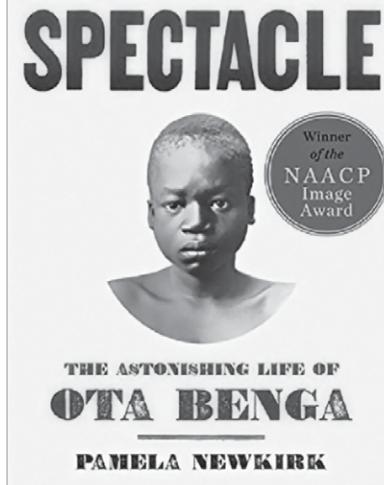
I have previously written about Ota Benga, the pygmy put on display in a zoo, but have since located research by several historians that sheds much new light on this tragic historical event.<sup>1</sup> The new research has corrected a major shortcoming of the major past work on the event co-written by Phillips Verner Bradford, the grandson of the man who brought Ota to America.<sup>2</sup> The new book about the case, reviewed here, shows Samuel Verner in a very different, and far less favourable, light. The author is Pamela Newkirk, an award-winning journalist and professor of journalism at New York University.

We now have a much better understanding of some of the major events in the case, such as how his experience of being caged in the zoo seriously affected Ota emotionally. Furthermore, Newkirk documents in detail both the academic community’s open support for his display in the zoo and their opposition against the movement to set him free.

### The Ota Benga case

Ota Benga, a 100-pound, 1.5m (4 ft 11 in) tall 23-year-old pygmy from Africa, was brought to the 1904 Saint Louis, Missouri, World’s Fair to be put on display as an inferior species

“A RIVETING ACCOUNT OF ONE OF THE MORE STARTLING EPISODES IN THE... HISTORY OF RACE IN AMERICA.”  
—WALL STREET JOURNAL



of human in an ‘anthropology’ exhibit, ‘The Pygmies’. Both children and adults, described by the scientists as “subhuman, cannibalistic dwarfs” were captured in Africa so as to be exploited in the anthropology exhibits (p. 138). Ota was only one of a total of several thousand persons exhibited in the anthropology exhibits, and the pygmies were one of the most popular parts of the entire exhibit (p. 129). This was partly because pygmies were among the smallest in size, closer to a chimp than any other large people group known then. They were also claimed by the persons directing the exhibits to be one of the most primitive and ‘least advanced’ people known then (p. 129). The inferior race headlines about pygmies soon filled the local papers, such as one that declared the “Pygmies Demand a Monkey Diet” (p. 126).

The seven-month run of the anthropology exhibit was a smashing success. An estimated 12 million visitors paid to get in, and the often-cited total

attendance was close to 20 million. The anthropology exhibits of primitive tribes would today correctly be viewed as insensitive, even abhorrent, racist displays. In turn-of-the-century America they were viewed as an academic study of our ancestors, who were not quite fully human.

After the World's Fair ended, Ota was eventually housed at the New York City Bronx Zoo with the primates in the primate house. He was displayed with the monkeys as 'the missing link' between human and apes. In the eyes of many evolutionists, he was clear proof of Darwin's theory of evolution. The question has always been:

"*Ist das ein Mensch?*" Is it a man?<sup>3</sup>—one woman asked in German ... Could this caged creature be ... the incarnation of one of the characters in best-selling books like ... *The Negro a Beast*, published in 1900, or the 'half child, half animal', described in Thomas Dixon's *The Clansman*, published the previous year, 'whose speech knows no word of love, whose passions, once aroused, are as the fury of the tiger'? Could he be the missing link, the species bridging man and ape that preoccupied leading scholars?" (p. 9).

For example, *Scientific American* described Ota as 'a cannibal' by an author who "put his unscientific ideas and racial biases on full display [claiming]... 'Their faces are coarse, features brutal, and [display] evidence of intelligence of an extremely low order'" (p. 132).

### Ota's suffering during his confinement

In contrast to Bradford, Professor Newkirk painted a very different picture of Ota Benga's experience in the monkey house as proof of evolution. When Ota was placed in the monkey cage, he was, Newkirk claimed, forced to endure "the gawking

of spectators utterly indifferent to his feelings. They howled. Gasped. Gaped. Pointed. Jeered. Benga frequently walked to the door with eyes pleading for his keepers to release him from public view" (p. 12). Ota "could feel both the sting of their scorn and the pang of their pity" (p. 12). According to Professor Gump, and documented by psychological research, Ota's experience was a "searing, painful experience ... not substantially different from the effects of physical torture."<sup>4</sup>

This research helps to understand Ota's response as he endured the gawking of spectators who appeared utterly indifferent to his feelings, which would be expected if he was not fully human, which many believed was the case. One motive of those clergymen who wanted to free Ota was their observation that he was *fully* human and his "sadness was palpable" (p. 33). Evidence also exists that later in life Ota suffered from post-traumatic stress syndrome due to "the trauma of being caged, heckled, and attacked at the zoo ... by those determined to prove he belonged to an inferior species" (pp. 189, 198).

### Scientists' support for confinement

Professor Newkirk did not hold back concerning the ringleaders of the event, especially the scientists who caged him for public display so that the world could see with their own eyes what they labelled a creature less evolved than modern humans. Not unexpectedly, Ota drew large crowds and earned a great deal of money for the zoo from visitors who wanted to see for themselves this living proof of evolution. The fact is, the 'exhibit' was:

"... on the respectable grounds of a world-class zoological park [and] had been sanctioned by Hornaday, one of the world's

leading zoologists, and by Henry Fairfield Osborn, among his era's most eminent scientists. As an undergraduate at Princeton University, Osborn had spent three months at Cambridge University under the tutelage of the famous British zoologist Francis Balfour; and a summer at London's Royal College of Science with biologist Thomas Huxley, who became known as 'Darwin's bulldog' for his fierce championship of the theory of evolution by natural selection. Osborn went on to earn a doctor of science degree from Princeton, where for twelve years he taught biology and comparative anatomy" (pp. 13–14).

Furthermore, Ota was a Bushman, a "race that scientists do not rate high on the human scale" of evolution. Nonetheless, to the average non-scientific sightseers in the crowd there was "something about the display that was unpleasant" (p. 13). Newkirk detailed how leading academics, many with degrees from Ivy league colleges, including Princeton and Harvard, actively supported racism based on evolution. She documented that the fight to release Ota from the cage was openly opposed by many powerful, famous academics. Their opposition to helping Ota was openly due to their Darwinian worldview. These leading academics

"... applied Darwin's evolutionary theory—and the notion of survival of the fittest—to race, insisting that it ... explained the plight of blacks and the supposed racial superiority of whites. ... Hornaday said that while he did in fact support Darwin's theory ... 'I am giving the exhibition purely as an ethnological exhibit'" (p. 35).

This case is not only about Ota Benga, but the racist society that existed in America when Ota was alive in the early 1900s. Rev. Dr Robert MacArthur, the white pastor of the large Manhattan Calvary Baptist

Church (1910 membership: 2,300), led the fight against the scientists, taking on not only the director of the zoo, Dr Hornaday, but he also challenged

“... an esteemed institution whose cofounders included a president of the United States; an eminent scientist; and the high-society lawyer Madison Grant, the Zoological Society’s secretary. Moreover, Hornaday was himself the nation’s foremost zoologist and a close acquaintance of President Theodore Roosevelt” (p. 29).

Anthropologist Madison Grant, a cofounder of the zoo Hornaday directed, authored the enormously influential 1916 racist book titled *The Passing of the Great Race*<sup>5</sup>, which openly

“... advocated cleansing America of ‘inferior races’ through birth control, anti-miscegenation ... racial segregation laws, and mass sterilization. He argued that Negroes were so inferior to Nordic whites that they were separate species and infamously warned: ‘... the result of the mixture of two races, in the long run, gives us a race reverting to the more ancient, ... lower type. The cross between a white man and an Indian is an Indian; the cross between a white man and a negro is a negro; the cross between a white man and a Hindu is a Hindu; and the cross between any of the three European races and a Jew is a Jew’” (p. 43).

Grant’s book also influenced the development of Adolf Hitler’s racist ideas.<sup>6</sup> The list of those who did nothing to help Ota, and even resisted efforts by others to help him, included President Theodore Roosevelt and President Woodrow Wilson. Furthermore, “Echoing the sentiments of the esteemed Men of Science”, the *New York Times* editors were “confounded by the protests”, explaining that they did not

“... understand all the emotion which others are expressing in the matter ... Ota Benga ... is a normal specimen of his race or

tribe ... . Whether they are held to be illustrations of arrested development, and really closer to the anthropoid apes than the other African savages, or whether they are viewed as the degenerate descendants of ordinary negroes, they are of equal interest to the student of ethnology, and can be studied with profit” (p. 38).

Divesting Benga of human emotion, and ignoring the many accounts of his distress, was the view reported in a *New York Times* editorial that claimed it was absurd that Benga could be suffering or experiencing humiliation because pygmies

“... are very low in the human scale, and the suggestion that Benga should be in a school instead of a cage ignores the high probability that school would be a place of torture to him. ... The idea that men

are all much alike except as they have had or lacked opportunities for getting an education of books is now far out of date” (p. 38).

This was the conclusion “espoused by generations of leading scientists”, including Louis Agassiz, the Harvard professor who “was arguably America’s most venerated scientist, [and] had for more than two decades insisted that blacks were a separate species, a ‘degraded and degenerate race’”<sup>7</sup>. In his address as outgoing president of *The American Association for the Advancement of Science*, University of Pennsylvania professor of linguistics and archaeology, Daniel Garrison Brinton

“... rebutted claims that education and opportunity accounted for varying levels of achievement along racial lines [concluding]; The black, the brown, and the red races differ anatomically so much from the white, especially in their splanchnic [internal, especially abdominal] organs, that even with equal cerebral capacity they never could rival its results by equal efforts ...” (p. 38).

The New York *Evening Post*’s headline was typical of this sentiment: “A Pygmy among the primates.” The *Minneapolis Journal* went further, proclaiming that Ota “is about as near an approach to the missing link as any human species yet found” (p. 72). The Ota Benga case was not by any means unique. One of many examples included a South African woman, Sara(h) Baartman, who was exhibited barely clad throughout London and Paris for years as the “Hottentot Venus”.<sup>8</sup> She was also touted by scientists as the link between humans and the lower apes.<sup>9</sup> The famous scientist Georges Cuvier, the founding father of the vertebrate paleontology field, performed an autopsy on her

“...and concluded that she and the so-called Hottentots were more akin to apes than to humans. He made a cast of Baartman’s body



Figure 1. Ota Benga and Polly the chimpanzee at Bronx Zop

and preserved her brain, genitals, and skeleton, ensuring that even in death, she'd draw a crowd. While Benga was being exhibited in a monkey house cage, Baartman's remains—her brain, genitals, and skeleton—were still on display in case number 33 at the Paris Musée de l'Homme" (pp. 16–17).

Most people today "find such behavior both racist and morally contemptible", but in "the era's elite white circles Cuvier was generally considered an embodiment of scientific truth" (p. 37). This was despite the fact that Cuvier had met her when she was alive, and then noted her intelligence, ability to speak several languages, and skill with a musical instrument; and even thought that her hands and feet were pretty. Long after the death of Baartman,

"... human zoos celebrating Europeans' conquest of purportedly primitive people remained popular in Europe; these included zoos in Hamburg, Barcelona, and Milan. Carl Hagenbeck ... exhibited Samoan and Sami people to great success in 1874. So popular was his 1876 exhibit of Egyptian Nubians that it toured Berlin, Paris, and London. A year later Geoffroy de Saint-Hilaire, director of the *Jardin Zoologique d'Acclimation* in Paris, organized exhibits of Nubians and Inuit seen by one million people; and in 1885, King Leopold II of Belgium exhibited several hundred of his newly conquered Congolese people in Brussels to appreciative crowds" (p. 17).

### **Scientific opposition to his confinement**

Professor Franz Boas (1858–1942) was one of the very few scientists then that was opposed to the racism based on evolutionary biology. He is regarded as one of the most prominent opponents of the then-dominant scientific racist ideology, the idea that

race is a biological concept and that human behaviour is best understood as caused largely by biology. Boas probably did more to combat race prejudice than any other person of his day.<sup>10</sup>

Boas was appointed lecturer in physical anthropology at Columbia University in 1896 and was promoted to Professor of Anthropology in 1899. For much of his career, he spoke out against Darwinian eugenics and the racism that it birthed. Unfortunately, Boas "was drowned out by a chorus of American and European scientists who ranked the world's races ... with Europeans at the top and Africans at the bottom" (pp. 44–45). Because Boas was a German Jew, it was alleged that his conclusions about race were neither objective nor factual. It didn't help that he undermined his own arguments by dogmatizing cultural relativism, which is antithetical to objective right and wrong.

### **Other opposition to Ota's confinement**

The few persons determined to stop the mistreatment of Ota included mostly black Christian ministers led by a white man, Rev. Robert Stuart MacArthur, all of whom opposed Darwinism, and thus were against putting Ota on display to prove a worldview they believed was both morally and scientifically wrong. The black ministers who supported freeing Ota concluded, according to a 2 September 1906 report in the *New York Times*: "We think we can do better for him than make an exhibition of him—an exhibition as it seems to us to corroborate the theory of evolution—the Darwinian theory"; a theory, they noted, they do not accept (p. 35).

Ironically, Hornaday "insisted that the exhibit was in keeping with human exhibitions in Europe" noting the "Continent's indisputable status as the world's paragon of culture and

civilization" (p. 16). As the opposition by the Baptist ministers increased, the *New York Times* finally took note with the headline, "Man and monkey show disapproved by clergy". Eventually, this turmoil, including protest from the creationist ministers, resulted in Ota's release. In the end, Ota committed suicide. One can only wonder about the possible influence his experience of being displayed in a zoo with monkeys had on his tragic end.

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# Social animals

**Blueprint: The evolutionary origins of a good society**

Nicholas A. Christakis

Little, Brown Spark, New York, 2019

Daniel Davidson

People have an instinctive sense of how to be cooperative, make friends, find love, and learn new things. Shocking? For the average person on the street, probably not. Sure, there's lots of negativity in every culture. There's plenty that one readily recognizes as the opposite of social—what one might even dare to describe as bad, evil. But that's another conversation. Most people will agree with the simple point that people seem to come equipped with at least some basic capabilities, and sometimes even good instincts, for how to get along in a social world. After all, we are social creatures. We sense these instincts within ourselves.

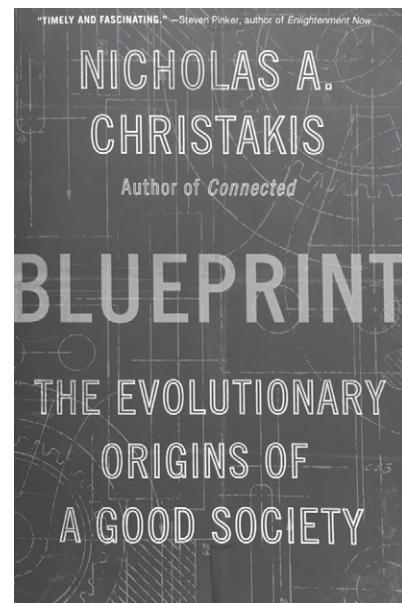
In some circles, though, the hard-wired instinct for social interaction is surprising. Strong critiques of the idea that there is any fixed, universal human nature have been under attack in many academic circles, particularly in the humanities and certain social sciences. In these circles, human social arrangements are more commonly described as constructed, not innate. The concept of a fixed human nature is dismissed as a relic of old fashioned (and, doubtless, misguided) philosophical or (maybe) religious commitments.

Into this fray comes Nicholas Christakis, a professor at Yale with training in medicine and sociology. He runs Yale's Human Nature Lab, a hub for cutting-edge research at the intersection of the social sciences

and biology. Drawing on his research there and his broad reading in related fields, Christakis offers *Blueprint* as his grand argument that humans do have an innate human nature and that this human nature predisposes humans for their social activities. Humans possess a ‘social suite,’ Christakis writes, a set of abilities and inclinations that together make sociability—and with it, society itself—possible. And according to Christakis, this social suite is best understood as rooted in genetics and as an evolutionary adaptation.

Creationists approaching the book can find lots of things to criticize and critique. Christakis’s approach to human nature seems to be fundamentally shaped by evolution. And at times Christakis veers toward reductionism, in the sense that he sometimes reduces mental and emotional aspects of humanness to purely biological phenomena. And Christakis assumes that humans are a form of animal; this allows him to draw freely from studies of animal sociability when trying to understand human sociability.

But the book’s evolutionary philosophy is, in other regards, less pervasive than I initially expected it might be. Christakis generally stops short of really proffering arguments for evolution as the origin of sociability. He doesn’t spend much time explaining how the human mind (or animal minds, for that matter) came about from non-mind. Nor does he explain how one kind of animal’s mind might evolve into another. If one can look past the trappings of evolutionary thought in the book’s rhetoric, there is much here that the discerning Christian reader can find valuable in understanding God’s remarkable creation. A substantial component of the book comprises fascinating descriptions of research on human sociability. And because Christakis is a good observational



social scientist, these descriptions can be disentangled from the evolutionary assumptions.

## The social suite

Christakis starts the book by describing a set of characteristics that together he terms the ‘social suite’. These are (p. 13):

1. the capacity to have and recognize individual identity
2. love for partners and offspring
3. friendship
4. social networks
5. cooperation
6. preference for one’s own group (that is, ‘in-group bias’)
7. mild hierarchy (that is, relative egalitarianism)
8. social learning and teaching.

Most of these are appealing. As Christians, we can see most of these as part of God’s design for humans. We were made with individuality, as unique creations of God with personality (Psalm 139). We were designed not to be alone but to love God and others: “Then the Lord God said, ‘It is not good that the man should be alone; I will make him a helper fit for him’” (Genesis 2:18, ESV). A proclivity to love one’s partner (spouse) was part of the

original creation order. Care for one's children, too, is basic to God's design for the human condition (Isaiah 49:15; Matthew 7:9–11). God also commends friendship and the wise development of what we might call social networks (Proverbs 27:9; Proverbs 13:20). He designed people with the capacity to work together (Adam and Eve were jointly given the command to tend the garden and care for creation, Genesis 1:28) and with the ability to teach and learn from each other (Proverbs 1:5).

Christakis's sixth characteristic, in-group bias, is more ambiguous. Scripture certainly recognizes that people are expected to prioritize. Parents are expected to provide for their children first of all before calling on other support structures (1 Timothy 5:8). And "Greater love has no one than this, that someone lay down his life for his *friends*" (John 15:13). The extraordinary character of God's love is evident in that He loved us while we were still His enemies (Romans 5:7–8). Does this imply that selfless love of others, without in-group bias, is God's ideal?

Does this suggest that in-group bias is a product of the Fall? Or is a preference for one's close relatives a natural component of the created order and the expression of selfless love without in-group bias a special gift above and beyond the normal created order? However one works out the details of a Christian theological anthropology of friendship, it's sufficient for present purposes to note that Scripture recognizes the existence of a general preference for one's own group. It indeed assumes some form of this as a starting point for Scripture's own analysis of personal obligations.

Mild hierarchy is also ambiguous as to whether one can assume this as part of the created order or a product of the Fall. After the Fall, Scripture is clear that there have been put in place authority structures that we might term hierarchical. Scripture admonishes individuals to respect authorities in family, church, employment, and

state. Within the big tent of Christian orthodoxy, various Christian traditions differ in exactly how to interpret hierarchical relationships (different understandings of family authority, of ecclesiology, and of the relationship of the individual to civil governments). But that there's some biblical principle of authority is beyond argument and is universally accepted by orthodox Christian traditions. So here, too, some amount of hierarchy is part of the Christian understanding. The emphasis is a bit different from Christakis's—he focuses on the relative status of individuals based on their perceived prestige and value in a social network. But there is, in any case, a point of contact between Christakis's observations and the biblical presentation of God's design for human society.

Creationists can accept and indeed celebrate the characteristics of what Christakis terms the 'social suite' as part of God's very good design for humans. Christakis helps us to recognize how pervasive these are and how essential to human society.

## Methods

Much of the book is devoted to arguing that the social suite is universal to the human experience, contrary to the radical constructivists, who would hold that human nature is endlessly malleable. When claiming that a trait is universal, Christakis doesn't mean that there aren't exceptions to every trait, in the sense that not everyone exhibits this trait. The point is instead that inherent in being human is a capacity for love, friendship, and cooperation, even if individuals aren't always loving, friendly, or cooperative.

At the beginning of the book, Christakis devotes several chapters to engaging descriptions of the methods he relies upon. His aim here is to explain how one can study the fundamentals of human society in a rigorous manner. One chapter is devoted to natural experiments from history. Communities stranded due to shipwreck, for instance, provide fascinating data about the conditions that allow for the survival of a small society in survival conditions (figure 1). They illustrate again and again that those communities that are



**Figure 1.** Mutineers on the HMS Bounty cast the ship's captain adrift before taking the Bounty on a long voyage, ultimately arriving at remote Pitcairn Island. Isolated communities, often created by shipwreck, provide real-world tests of what is required for successful societies, as Nicholas Christakis explains.

cooperative and friendly succeed. On the other hand, when shipwrecked individuals behave in competitive ways, try to freeload on others, and generally lack trust, compassion, and cohesion, they tend to fare poorly in survival conditions. Another chapter introduces various ways of utilizing ‘artificial communities’ as test subjects. These can be more traditional groups of experiment subjects, as has long been done in psychological research. This can also include players of massive online games and participants in larger online study groups. These more artificial settings allow researchers to control for variables and be sure of causation as they observe various social interactions and phenomena. Here, too, “people behave in very human ways, creating types of social order that comport with the rules of the social suite” (p. 109).

### A friendly world

Subsequent chapters turn to examine the various components of the social suite. On friendship, for instance, Christakis starts with a rich description of the sociology and anthropology of

friendship. He describes interesting research mapping friendship networks in various cultures, efforts to enumerate characteristics of friendships in multiple cultures, and more. It turns out that feelings of friendship are more common than animosity and that friends were more likely to reciprocate friendship than enemies were to reciprocate animosity (p. 262). Christakis takes this as encouraging evidence that evolution turned out a more or less social and good product. He also sees this as part of a larger case he is interested in building that evolution fosters good rather than primarily fostering a ruthless world of individualistic survival of the fittest.

For the Christian, the evidence that there is a great deal of positive social capability and practice in the world has to be processed, not as the product of evolution, but as the product, first of all, of God’s good design. The Christian also recognizes that humans have fallen into sin, explaining the pervasiveness of evil. And yet the Christian also recognizes that God still gives good gifts to man and prevents humankind from falling into the total chaos that sin would logically lead to.

(Some Reformed Protestant writers would term this God’s ‘common grace’.)

### Love, marriage, and the biblical pattern

In his chapter on love and commitment between partners, Christakis surveys anthropological research on the diversity of marriage practices around the world. The Hadza people of Tanzania live as foragers, a mode of life thought by evolutionary anthropologists to be one of the closest approximations available for how people lived in pre-agricultural times (prior to about ten thousand years ago, according to evolutionary timescales) (figure 2). As it turns out, Christakis writes, the Hadza approach to love and marriage is “recognizable to modern American eyes” (p. 140). They are generally monogamous (occasional exceptions were initiated by men but usually resulted in the first wife leaving). Young people choose their own partners after a brief courtship, usually around age seventeen or eighteen for women and two to four years older for men. The characteristics that young Hadza men and women value in a partner include character, looks, intelligence, and foraging ability. Sexual infidelity was the “leading reason given for divorce among the Hadza” (p. 143).

There are of course variations on themes when it comes to love, marriage, and commitment across cultures. Christakis considers examples of polygyny (more than one woman per man) and (rarer) polyandry (more than one man per woman). Christakis repeats the standard economic and environmental explanations: polygyny is common in the labor-intensive herder community of Turkana in western Kenya, where having the maximum number of children is valued to help with keeping the livestock. Polyandry is more common “in ecological situations where sustaining a household requires more than one



**Figure 2.** A traditional Hadza hut in Tanzania. Evolutionary anthropologists consider the Hadza people’s foraging lifestyle to be fairly representative of pre-agricultural human societies.

man—for example, when one man must travel long distances to support the family and another is needed to guard the home” (p. 153). Christians reading this book can recognize that marriage relationships are shaped by much more than just utilitarian economic analysis. And yet they can also recognize that environment and economics help us to understand the development of human institutions and the ways that (in a fallen world) they deviate from God’s original design.

An extreme outlier case where sex comes without marriage commitment or anything that resembles it is that of the Na, a farming group in the mountains near Tibet. But in the end, this exception reinforces the prevalence of the rule. In a matrilineal society, the norm is that there is very little lasting partnering between men and women at all; instead, there are short ‘visits’ from a man to a woman without long-term commitment. Christakis notes that this is exceptional. He suggests that every human experiences ‘fundamental’ desires that are irreconcilable: “to possess one’s partner and to have multiple partners” (p. 163). Across human society and ‘evolutionary time’, he says, “attachment has proven the stronger force” and has been institutionally adopted. The Na are unusual in opting to institutionalize the multiple-partner arrangement. And yet, Christakis notes, the choice is not easy: “An elaborate cultural edifice is required to suppress our deep, ancient desire to possess our partners and feel attachment and love for them” (p. 164).

For Christians reading this book, there is much here to appreciate. If one can look past the casual evolutionary rhetoric, there is actually a great deal of good sociological and anthropological material here that reinforces the biblical position. Marriage and commitment are part of God’s design because it works. We live in a fallen world in which people deviate from God’s pattern. But it takes work to suppress the truth (Romans 1:18).

### Social animals

Throughout the book, Christakis regularly references research on animal sociability. From an evolutionary perspective, there’s no reason to think that humans are different in kind from animals. So it is natural for Christakis to draw analogies between the social networks formed by humans and by elephants, or to reflect on the friendships formed by chimpanzees as roughly similar to patterns among people. Biblical creationists ought to be more wary than Christakis, aware of the crucial distinctions between humans and other animals. But once this is kept in mind, there’s nothing wrong with looking for the similarities across the animal kingdom and with the capabilities for sociability built into many animals to differing degrees. The fascinating research on animal sociability doesn’t mean that humans and elephants are closely related, even in an evolutionary theory. For a creationist, the similarities, where they exist, can be acknowledged and studied as a way of appreciating the extraordinary handiwork of the Creator, and of better understanding where the same design features and capacities show up in different places of the creation.

### Biological reductionism

In parts of the book, Christakis offers biological explanations for social phenomena. This isn’t always a problem and is sometimes unarguable. Domestication of various animals demonstrates that some species’ sociability is deeply connected to their biology. (Scientists are still working hard to understand the incredibly complicated interplay between the various genes associated with domestication.<sup>1</sup>) Similarly, it is not necessary to be an evolutionist to find it unsurprising that there are strong correlations between genetic similarity and friendship. Sometimes this is a matter of having a similar

ethnic background (Greeks choosing other Greeks as their friends) or because similar genetics lead to similar propensities—athletic people befriend athletic people (pp. 255–257). But sometimes this is where Christakis veers into his most direct evolutionary story-telling, arguing, for instance, that humans self-domesticated over a relatively long amount of time. This, however, isn’t necessary from a creationist perspective—God *designed* people to be social. So the creationist doesn’t need to explain how violent hominoid animals became more domestic.

At other times, Christakis dabbles with evolutionary accounts of human behavior that he acknowledges may too easily “become … just-so stories” (p. 190). In explaining pair bonding, for instance, Christakis discusses several highly speculative theories. These include that hormones that help women bond with their children evolved to incidentally benefit partners as well, or that men evolved to be territorial and that these same neural pathways were then applied to mates, such that they, too, were subconsciously thought of as a kind of territory. (Christakis hedges this latter theory about with qualifications to make clear that neither he nor the evolutionary psychologist who first proposed the theory believe that women are possessions.) That there are biological phenomena (hormones, physical similarities, and more) that affect human relationships is not a problem from a creationist perspective. But the evolutionary explanations for their origin are hardly compelling parts of the analysis. And, more generally, creationists should be wary of efforts to invoke biology to explain the maximum amount of human behavior. The human mind is much more than biology. One of the fundamental problems in evolutionary psychology is its tendency to treat the mind as a purely physical entity that can be controlled and explained by genetics (and evolution).<sup>2</sup> Christakis’s

book is at its least compelling when he pursues these lines of inquiry.

### Conclusion

Christakis fills the book with references to evolution. Evolution, he says, is the source of the relevant human skills, instincts, and abilities that make possible the ‘social suite’. Yet the book does not develop strong arguments for this evolutionary development. More often, evolution is the hero of a just-so story that supplements the actually fascinating social scientific and biological research that Christakis writes about. For the careful creationist reader who can look past the evolutionary trappings, there is actually much in this book that should inspire appreciation—and further research—on the remarkable set of capabilities that God gave to enable humans to form societies and live lives as social beings.

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# Scientism and secularism ... and Scripture?

**Secularism and Scientism: Learning to respond to a dangerous ideology**  
J.P. Moreland  
Crossway, Wheaton, IL, 2018

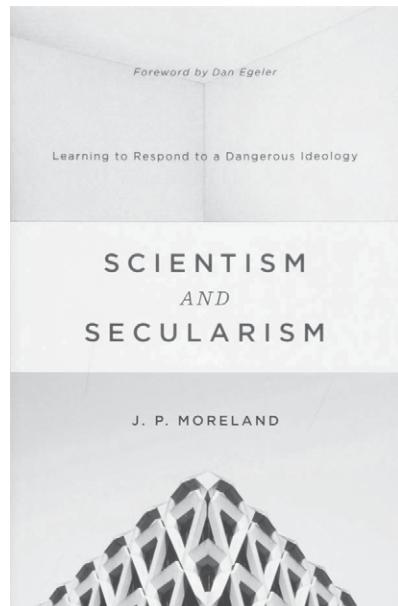
Shaun Doyle

**S**cience is king. At least, that is the way science is presented in our secular culture today. No other way of knowing about the world is as highly celebrated or regarded as science. But this has led to an overweening reliance on science called *scientism*. How should Christians respond to this?

*Scientism and Secularism* aims to help Christians, according to the subtitle, in “Learning to Respond to a Dangerous Ideology”. The author, J.P. Moreland, is Distinguished Professor of Philosophy at Talbot School of Theology at Biola University in La Mirada, California. And he offers many helpful ways to respond to scientism. Nonetheless, the content sometimes repeats itself, and it is hard to know what audience he was trying to target. The technical discussions, especially of epistemology and philosophy of mind, are likely to turn off some of the readers who most need to hear the core message of this book. Moreover, his commitment to deep time at crucial points also stunts a properly Bible-based response to this “dangerous ideology” of our day.

### Chapter 1: The scientificistic air we breathe

What is scientism? Moreland defines it, quoting philosopher of science Tom Sorrell:



“Scientism is the belief that science, especially natural science, is ... the most valuable part of human learning ... because it is much the most [sic] authoritative, or serious, or beneficial. Other beliefs related to this one may also be regarded as scientific, e.g., the belief that science is the only valuable part of human learning” (p. 29).

Moreland discerns two forms of scientism from Sorrell. First, *strong scientism*, which says that something is true, rationally justified, or known *only* if it’s a scientific claim that has been successfully tested by proper scientific methods. Second, *weak scientism* which formally acknowledges truths outside science, but still says that science is a far more authoritative and trustworthy way to know anything.

Scientism is the air our culture breathes. It pops up in all sorts of contexts. For instance, Moreland once told a nurse he had changed academic paths from chemistry to philosophy, and she wondered why he went from

studying ‘hard facts’ in chemistry to musing on ‘private opinions’ in philosophy (pp. 25–26). Examples of this divide between ‘knowing’ scientific facts about something and ‘believing’ non-scientific things crop up everywhere, such popular magazines and even in a California science standards document (pp. 26–29).

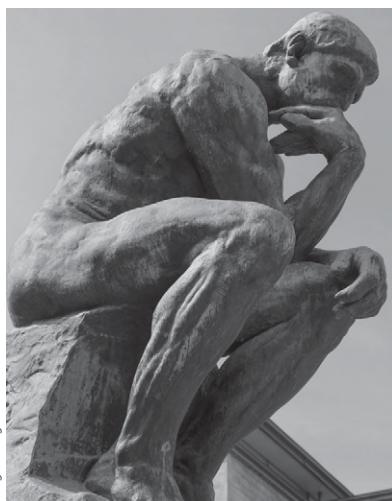
## Chapter 2: How scientism affects us

Why does scientism matter? First, Moreland states that scientism is part of our culture’s “plausibility structure”—a set of background assumptions that shapes what people consider plausible or implausible (p. 31). Christianity is a ‘religion’ and thus not ‘scientific’, so it’s prejudged as unworthy of rational consideration.

Moreland also lists several culture shifts that have come from the widespread acceptance of scientism (pp. 33–38). Religion and ethics shift from knowledge to blind faith. People now guide their lives by the immediate satisfaction of desire rather than truth. People’s ethics shift from duty and virtue to a do-no-harm minimalism. ‘Freedom’ gets redefined from ‘the power to do what one ought’ to ‘the right to do whatever one wants’. And ‘tolerance’ gets redefined from ‘putting up with someone you disagree with’ to ‘accepting all (non-scientific) views as valid’.

Scientism also affects the church (pp. 38–42). It undercuts our attempts to raise and keep our children in the faith. It is behind some of the biggest reasons why people leave the church, e.g. shallowness of thought, inability to express doubts or get answers to questions, and an anti-science attitude. In a culture where science is king, instead of developing a strong response to scientism, we instead have often settled for simplistic preaching and feel-good ‘worship’ rather than addressing the tough questions properly.

Image: Douglas O'Brien/CC BY-SA 2.0



**Figure 1.** Philosophical assumptions ground science, so science can't be the only way to know things.

## Chapter 3: How scientism changed the universities

Moreland then documents some of the changes that occurred in American universities between 1880 and 1930 which explain the rise of scientism. In the 1880s, for most people, including those in universities, “religious, especially Christian, claims and common-sense notions were placed on an equal footing as sources of knowledge along with scientific theories!” (p. 44).

What happened? God was the uniting anchor of truth for the diverse disciplines studied, hence ‘university’. But over time a fact/value distinction came about, such that values were private, subjective, and culturally relative, whereas ‘facts’ were public, objective, and *empirical/scientific*. God was likewise regarded as a private opinion, and thus was cast aside as the uniter of truth.

However, Moreland’s analysis doesn’t really go back far enough. By the 1880s, many things in Western nations had changed in a decidedly scientistic direction that laid the groundwork for this social shift in the universities. The *vera causa* approach that emerged out of Newtonian physics was applied elsewhere, e.g.

to history, to the Bible, and most poignantly for displacing the Bible as the foundation for history—geology and biology.<sup>1</sup> A science-centric worldview had been competing with Christianity for well over a century before the universities shifted.<sup>2</sup>

## Chapter 4: Scientism is self-refuting

The first big problem with scientism is that it is *self-refuting*. What is a self-refuting statement? Moreland helpfully explains:

“Such a statement has three features: (1) The claim establishes some requirement of acceptability for an assertion (such as having to be empirically verifiable). (2) The claim places itself in subjection to the requirement. (3) Then the claim falls short of satisfying the requirement of acceptability that the assertion itself stipulates. In other words, when a statement is included in its own subject matter (i.e., when it refers to itself) but fails to satisfy its own standards of acceptability, it is self-refuting” (p. 50).

A classic example is “All sentences are exactly three words long.” This statement clearly fulfils all three of Moreland’s criteria, and is thus self-refuting:

1. it establishes some requirement of acceptability—that every sentence is exactly three words long;
2. the statement is a sentence, so it puts itself under its own requirement for acceptability;
3. the sentence is more than three words long, so it fails its own requirement for acceptability.

Another example is the core claim of (strong) scientism: “Only what is testable by science can be true”. As Moreland explains:

1. Does this statement establish a requirement of acceptability?  
“Yes: it says that something must be testable to be *true*.”
2. Does this statement place itself in *subjection* to the requirement?  
“Yes: it purports to convey *truth*.”

3. Does this statement *fall short* of satisfying its own requirement? “Yes: this is a philosophical statement about science that cannot itself be tested by science [emphases in original] (p. 51).”

So yes, (strong) scientism is self-refuting. It is *necessarily* false; it cannot be true. No amount of future research or discoveries can make it true. And it doesn’t matter which skeptic says it—whether just a student or an academic professor—we don’t need to be intimidated when people make statements like this.

### **Chapter 5: Scientism is the enemy of science**

Not only is scientism self-refuting, but it’s also the enemy of science. But how can that be, when scientism says that science is the only or best way to knowledge? Moreland points out that scientism is not science; it’s philosophy (p. 55). He rightly points out that science rests on a bunch of philosophical presuppositions (figure 1). For example:

1. There is a mind-independent world ‘out there’.
2. The deep structure nature of the world is orderly.
3. Objective truth exists.
4. We can reliably gain knowledge of the world, including scientific knowledge, through our sense and cognitive faculties.
5. Various types of values and ‘oughts’ exist (e.g. moral, rational, and aesthetic).
6. The laws of logic and mathematics exist.

As such, the conclusions of science can only be as strong as its presuppositions. But this very fact makes for a powerful argument against scientism:

1. A successful argument for the claim that science is the paradigm of rationality must be based on the demonstration that the presuppositions of science are preferable to other presuppositions.

2. That demonstration requires showing that science, relying on these presuppositions, is better than its competitors at solving some problems and achieving some ideals.
3. But showing that cannot be the task of science.
4. It is, in fact, the task of philosophy.
5. Thus the enterprise of justifying the presuppositions of science by showing that, with their help, science is the best way of solving certain problems and achieving some ideals, is a necessary precondition of the justification of science.
6. Hence, philosophy, and not science, is a stronger candidate for being the paradigm of rationality. (p. 56).<sup>3</sup>

But what if someone claims science doesn’t rest on any assumptions? That too is a *philosophical* claim that can only be analyzed by philosophy, not science. Science is bound behind and before by philosophy; it cannot escape it, and it’s only as strong as the philosophy that undergirds it.

### **Chapter 6: Why weak scientism is no better than strong scientism**

What about weak scientism? Can we really put science above every other discipline as the most authoritative? This is an idea that has infected a large part of the church. Moreland gives a bunch of examples of this, showing how it undermines biblical authority:

*Homosexuality is caused by our DNA?*

No problem. The Bible doesn’t teach the immorality of homosexuality anyway.

*We have misread it for two thousand years. Neuroscience shows there is no soul?*

No problem. Dualism and the soul are Greek ideas not found in the Bible, which is more Hebraic and holistic.

*A completely naturalistic story of evolution is adequate to explain the origin and development of all life?*

No problem. After all, the Bible isn’t a science text.

*Studies in the human genome suggested human life did not begin with Adam and Eve?*

No problem. We can reread the historical narrative in a new way. And on and on it goes. (pp. 72–73).

One glaring example was conspicuous by its absence: ‘Scientists say the Earth is 4.5 billion years old.’ And the response: ‘Don’t worry, the Bible doesn’t really conflict with billions of years of “geologic time”.’

The responses are even worse than “the Bible is wrong”. Rather, to borrow Wolfgang Pauli’s withering criticism of a fact-free physics paper, it amounts to “the Bible is not even wrong”—i.e. the Bible is no longer regarded as making any truth claims worthy of refuting.<sup>4</sup>

Nonetheless, Moreland points out that weak scientism gives more rational authority to the conclusions of science than the assumptions on which science rests (pp. 74–75). It’s a weird inversion of rational authority that undercuts the very primacy of science that weak scientism seeks to establish.

### **Chapter 7: The availability of non-scientific knowledge**

Moreland leaves aside his critique of scientism to point out that there are things we can know with greater certainty, and in different ways, than we know the claims of the hard sciences. He gives several examples; I will list some of them.

First, we can know logic and maths without appealing to sense experience, unlike science (p. 77). That’s because they are *necessary* truths— $2+2$  must equal 4—whereas scientific claims are contingent.

Second, we have greater rational authority about what is happening inside our minds than anyone else does (p. 79). We know them by direct introspection. Even a neuroscientist can’t know with greater certainty than me what’s going on in my mind. If I don’t know, they have no way to know.

Moral knowledge is another category (p. 80). Consider this self-evident moral truth: ‘It’s wrong to

torture babies just for the fun of it.’ Society could abandon this truth, but it’s practically inconceivable that anything could make believing it *completely irrational* in the next 50–100 years. However, we can easily imagine our model of the electron changing in the next 50–100 years, making it no longer rational to believe our current one. Science changes like that all the time. So, if a scientific claim is easier to rationally abandon than an obvious ethical claim, the ethical claim has greater epistemic weight than the scientific claim. Sometimes, ethics is more certain than science ever can be.

### **Chapter 8: When science exceeds its reach: a case study**

Moreland next gives an example of science overreaching—the study of human consciousness. There are things we know about mental states, and we don’t need neuroscience to know them. You’re aware of them simply by introspection.

Inserting neuroscience into some of these issues, Moreland contends, distorts this reasonably simple picture by insisting that mental states are in some way physical states. He then canvasses a few options that have been offered: behaviourism,<sup>5</sup> type identity theory,<sup>6</sup> and functionalism.<sup>7</sup> But none of these theories get at what e.g. pain *is*. Pain is a feeling of hurt—it’s not identical to what causes it, what it does, or what it causes. Neuroscience has no special access to what you feel—but *you do*.

Moreland isn’t against neuroscience; he just thinks it has limits: “Science is helpful in answering questions about what factors in the brain and body generally hinder or cause mental states to obtain, but science is largely silent about the nature of mental properties/states” (p. 94).

### **Chapters 9 and 10: Scientism and first philosophy**

In the previous chapters, Moreland dismantled scientism, and showed that

science isn’t the only, or even the best, way to know things. But what do we build in its place? Moreland’s answer: “biblical studies and theology must join forces with a classic view of *first philosophy*” (p. 98).

First philosophy, Moreland explains, “is the notion that there is a realm of rational investigation that (1) is the proper domain of philosophy, (2) is independent of and, indeed, more basic or fundamental than science ... and (3) gives us knowledge of the topics studied in that realm, including knowledge of reality” (p. 98). In other words, first philosophy posits an *autonomy thesis*: philosophy asks questions that are outside the purview of science (e.g. are there such things as abstract objects?); and an *authority thesis*: on some issues both science and philosophy address, philosophical considerations carry more weight than scientific ones (e.g. the nature of time). He then goes on to analyze why first philosophy was abandoned, and then defend its validity.

Moreland then gives some examples of the autonomy and authority theses. On the authority thesis, he mentions Stephen Hawking’s ‘no boundary’ model for the beginning of the universe to get around the need for a beginning for time even for a finite past (p. 113). However, support for the universe’s beginning was stronger than support for Hawking’s model. Moreover, Hawking’s ‘imaginary time’ was metaphysically unintelligible, so his model is at best a useful fiction.

On the autonomy thesis, Moreland addresses issues in the philosophy of mind (p. 118). For instance, different metaphysics of mind can be empirically equivalent. If so, which one should we go with? Science can’t tell us; we must appeal to philosophical arguments to establish the best explanation.

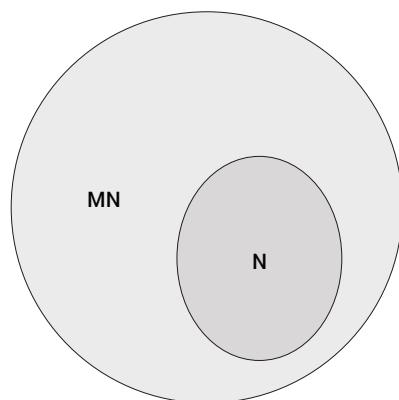
Second, who should define ‘science’ (p. 121)? Scientists, since they are practitioners, will typically think they are the best to define it. However, the practice of science doesn’t require one puzzle over how to define what science

is. There is no scientific experiment, procedure, or observation that could resolve the dispute. Defining concepts and delineating their scope of reference is a matter for philosophers, not scientists.

As Moreland concludes, “we often have more rational evidence and authority for the carefully developed theological claim than scientists do for their conflicting claim” (p. 123).

### **Chapters 11 and 12: How do we explain things?**

Following philosopher Richard Swinburne, Moreland distinguishes between two different types of explanations: *scientific* explanations and *personal* explanations. A scientific explanation explains a state or change of state in accordance with some law of nature and some initial conditions. It may also include some model that tells us *why* the universal law is true. On the other hand, “A *personal explanation* of some event or state of affairs intentionally brought about by a person (divine or otherwise) will employ notions such as the *intention* of the agent and the relevant *power* of



**Figure 2.** All metaphysical naturalists (N) are methodological naturalists (MN), but not all methodological naturalists are metaphysical naturalists. The problem is that word association between the two concepts is inevitable, and the term ‘methodological naturalism’ will always bias people in favour of *metaphysical naturalism*. (After National Center for Science Education<sup>12</sup>).

the agent that was exercised in causing the state of affairs" (p. 128).

In a murder trial, the jury ultimately seeks personal explanations: who did it? How? Did the killer actually have the capacity, at the right place and time? What was his intention? A scientific explanation, however, is not what *ultimately* interests the jury in a murder trial.<sup>8</sup> Nobody wants to know the natural law and relevant formula to calculate the mechanics of how the bullet fired from the gun; they want to know who killed the victim (or, more specifically, whether the defendant did).

But how do we tell when science can't explain something? Basically, Moreland breaks such phenomena into two categories: those that are too odd, and those that are too big (p. 129). Moreland gives four criteria for telling if something is too odd to be explained scientifically (pp. 129–134):

1. When you have to add new laws just to make sense of the event (p. 129).
2. When you have correlations leaving you with numerous unwieldy brute facts (p. 131).
3. When you have new phenomena utterly unique from anything in the old theory (p. 132).
4. When you have phenomena contingently related to physical facts (p. 133)

What about too big? Moreland outlines five things that he says science cannot even in principle explain (pp. 135–158):

- The origin of the universe
- The origin of the fundamental laws of nature
- The fine-tuning of the universe
- The origin of consciousness
- The existence of moral, rational, and aesthetic objective laws, and intrinsically valuable properties.

In most cases, Moreland rehearses some standard arguments for God, such as the Kalām cosmological argument, the fine-tuning argument, and the moral argument. But he also explores how science fails to address these questions. For instance, with the beginning of the universe, since scientific explanations presuppose the existence of the universe,

they clearly can't apply to its origin, since that would presuppose what needs to be explained. The same is true for the laws of nature. Consciousness struggles to be explainable scientifically because the link between brain states and mental states is purely contingent. For normative principles like morality, beauty, and rationality, science is merely descriptive and so can't even speak to their truth or falsehood.

### **Chapter 13: Methodological naturalism, theistic evolution, and intelligent design**

Methodological naturalism (MN) is "roughly, the idea that, while doing science, scientists must limit themselves to strictly naturalistic, materialistic explanations" (p. 160). It's different from metaphysical naturalism, which says that nature is all there is. One can follow methodological naturalism and not believe in metaphysical naturalism (figure 2). Moreland correctly points out that theistic evolutionists are among the staunchest defenders of this idea.

Moreland, however, rejects MN. For instance, MN has not made its case as a demarcation line between science and non-science. Moreover, intelligent agency, *contra* MN, is a part of science. Consider SETI, archaeology, or psychology. This even applies to God. Evolutionists often argue that if God were the designer of biology, organisms would be much better designed than they are, therefore evolution is a better explanation. But this assumes theological ideas have scientifically testable implications. And if theological ideas can be used to falsify God's activity in the natural world, why can't they be used to support God's activity in the natural world?

What of arguments for MN? The main one is the so-called 'God of the gaps' argument:

"This argument usually takes the following form: (1) God acts only when there are gaps in nature, (2) God is appealed to merely to fill up gaps in our scientific knowledge and cover our ignorance of naturalistic

mechanisms, (3) these gaps are used in apologetic, natural theology arguments to support Christian theism, (4) scientific progress is making these gaps increasingly rare, and thus, (5) this strategy is not a good one" (p. 168).

What does Moreland say in response (we have also previously said plenty<sup>9,10</sup>)? First, God's causal activity isn't limited to gaps in our scientific knowledge. God constantly sustains the whole universe. Moreover, we might expect a discontinuity in nature where God acted directly. Miracles are best identified against a backdrop of robust natural laws, so we expect gaps due to divine agency to be small and rare.

Moreland also points out that some subjects are not primarily apologetics-focused; they simply consult more than scientific data to explain phenomena in nature. He doesn't list any examples, but many aspects of creation research fall into this category: Flood modelling, creation cosmology, and baraminology. Even if they are useful for apologetics at times, they are primarily about understanding history from a biblical perspective.

Moreland also mentions the common divide between operational and historical science; God is irrelevant to the former, but may be relevant to the latter. He also points out that ID is formally agnostic about who the designer is. And the ID argument is not an appeal to gaps in our knowledge, but is based on what we *do* know about chemistry, information, and the limits of mutation + selection.

### **Chapters 14 and 15: The importance of integrating Christianity and science**

So then, how should we think about the relationship between Christianity and science? First, Moreland says, "about 95% of science and theology are cognitively irrelevant to each other (p. 173)."

What of the 5% where there is interaction? He says that most of it (~3%) gives evidential support

for Christian teaching. That leaves a minority (~2%) where there is an apparent conflict. He notes that little or none of this counts against God's existence or the core claims of the Gospel. However, most of the conflict revolves around inerrancy and interpretations of specific texts, especially Genesis 1–11.

But can we be rational and confident in the face of a consensus of experts who disagree with us? Moreland gives a few tips:

1. Make sure there is not an alternative interpretation of the Bible that is interpretively reasonable and that resolves the tension.
2. The presence of a band of highly trained, academically qualified scholars with a good track record for publishing in top journals or with highly regarded book publishers, and who are unified in rejecting the view.
3. There are good historical, sociological, or theological explanations for why the expert majority holds to the problematic view.
4. Given that Christianity is a highly rational worldview with much evidential and argumentative support, any view that cuts against central components of a Christian worldview should be rejected precisely due to that fact.

Amid explaining these points, Moreland rejects biblical creation. For him, the crucial reason why is point (1); he believes there are exegetically acceptable views of Genesis 1–11 that are compatible with deep time. He does however say that theistic evolution is exegetically unacceptable. As a result, he believes both young-age and old-age creationist views should be pursued.

We of course cannot agree with such an assessment. The Bible is as exegetically unfriendly to old-age creation as it is to theistic evolution. And there are several dangerous theological consequences of accepting deep time.<sup>11</sup> Still, Moreland here is probably one of the best examples of charity toward young-age creation

that one will find among those who disagree with us:

"However, I happily acknowledge that there are numerous well-trained and sophisticated advocates of young earth creationism, and I believe it is a position that should continue to be developed and supported by biblical exegesis and scientific research" (p. 189).

Moreover, all Moreland's factors apply to deep time as much as they do to evolution. There are strong exegetical reasons to reject it. Moreland admits there are numerous well-trained and sophisticated defenders of biblical creation. There are good historical explanations for why deep time is the mainstream view rather than a simple acceptance of the evidence. Finally, the strong ties between biblical creation and the basics of the Gospel provide rational warrant for rejecting deep time in light of Christianity being a highly rational worldview.

### One final plea

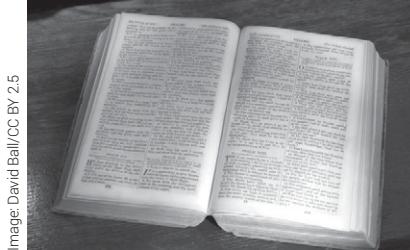
Moreland is right to call scientism "a silent and deadly killer of Christianity" (p. 197). And for the most part *Scientism and Secularism* does a powerful job refuting it. Biblical creationists would do well to understand the issues Moreland raises in this book.

Where it falls short, however, is in the positive integration of science and Christianity. The God of the Bible is the ground for science, so the Bible of God must be its constraint (figure 3). And this is true for all

facets of science, including historical geology and astronomy. Moreland's objections to scientism and evolution only take us part of the way there. We need to go further. Genesis 1–11 is the foundation of the Bible, and defending it and exploring how it coheres with the rocks, fossils, and stars is the crucial task biblical creationists must pursue.

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5. Behaviourism identifies conscious states with body movements.
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**Figure 3.** The God of the Bible is the ground for science, so the Bible of God must be its constraint.

Image:DavidBall/CC BY 2.5

# Reading Genesis badly

**Reading Genesis Well: Navigating history, poetry, science, and truth in Genesis 1–11**

C. John Collins

Zondervan, 2018

Andrew Kulikovsky

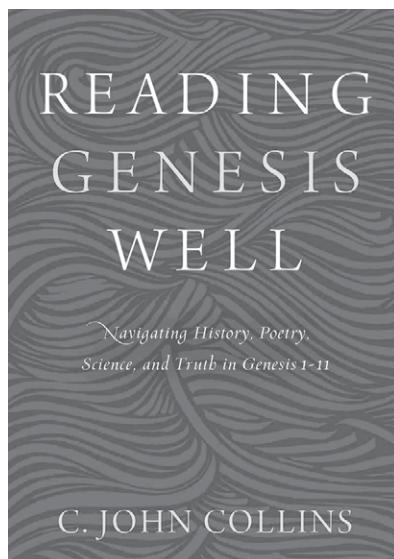
This book is yet another attempt by anti-young-earth creationist C. John Collins to justify his ‘Analogical Days’ interpretation of the Genesis creation account. Here, he expounds what he believes is the ‘correct’ or most well-informed interpretive process.

The author, Collins, is Professor of Old Testament at Covenant Theological Seminary (PCA) in St Louis, Missouri, and has both theological and scientific qualifications.<sup>1</sup> Like his previous book, *Science and Faith*, this work is far more comprehensive than most others, and his arguments are more sophisticated and nuanced.

This author’s strategy in this book is to lay out a hermeneutical methodology by which Christians should read and interpret the Genesis account.

## Hermeneutical background

Collins begins by briefly examining the hermeneutical background of biblical interpretation, using two 19<sup>th</sup>-century literary critics—Charles Goodwin and Benjamin Jowett (figure 1)—as representative of the main schools of thought. He points out that Goodwin wants to take words in their ‘plain’ sense, and he reads the biblical authors (and especially Genesis) as advocating a physical picture of the world. Goodwin objects to any effort to harmonise Genesis with current scientific theories because such efforts tamper with the plain meaning of the



Hebrew text. However, Goodwin acknowledges that the Genesis account of creation presents a view that is contrary to modern science (or rather, uniformitarian geology and evolutionary biology).

Regarding Jowett, Collins cites his comments regarding the recovery of the author’s meaning, i.e. what he originally intended to communicate to his audience:

“The office of the interpreter is not to add another [meaning], but to recover the original one; the meaning, that is, of the words as they first struck on the ears or flash before the eyes of those who heard and read them ... The simple words of that book he tries to preserve absolutely pure from the refinements or distinctions of later times” (p. 20).

Thus, like Goodwin, Jowett stresses what he calls “the natural meaning of particular expressions” (p. 20).

Collins points out that both Goodwin and Jowett insisted on the primacy of the ‘plain’ sense of the text. However, they also acknowledge that such readings of Genesis find the creation story at odds with the ‘more credible’ story offered by 19<sup>th</sup>-century

‘science’. Yet Goodwin and Jowett still reassure us that the spiritual value of the Bible can still be preserved.

According to Collins, orthodox Christians took one of two tacks in response to the above dilemma: (1) rejection of scientific theorising altogether, and acceptance of replacement theories such as ‘creation science’; or (2) accepting some of the theorising and showing the Bible’s compatibility with those parts (i.e. concordance). He notes that the second option appears to have been more common among the educated in the 19<sup>th</sup> century. However, Collins’ characterisation of creation science as a rejection of scientific theorising is inaccurate. Creation scientists do not reject scientific theorising. They simply start with different assumptions and presuppositions.

Similarly, Collins asserts that appealing to phenomenological language (the notion that biblical writers described things as they appear to human beings e.g. the sun looks like it rises) is a characteristic of the concordance view, but that is not the case. All interpreters following the standard historical-grammatical exegetical method—including those holding a Young-Earth Creationist (YEC) view—recognise the reality of phenomenological language.

Yet Collins claims that phenomenological language “has recently come into some disrepute” (p. 21) even among orthodox evangelicals because it is considered an invasion of the plain meaning of the biblical text. But the basis for this extraordinary claim is *The Bible, Rocks and Time* by Davis Young and Ralph Stearley (2008).<sup>2</sup> However, given that both co-authors are geologists, their assessment for what is acceptable in the field of biblical hermeneutics is of little value—especially since it is simply not true! Collins goes on to suggest phenomenological language is arbitrary. Again, this is not true, and even if it was, the same could be said about much of Collins’ own interpretation.

Regarding the modern creation science movement, Collins asserts that their alternative scientific accounts of various geological and cosmological features have the same arbitrary feel because they do not apply their theorising consistently, and appeal to God's actions when they have no scientific explanation. But this is because creationists reject the notion of a purely naturalistic universe and allow for God's supernatural actions in our space and time.

Collins also notes that Old Testament Scholar James Barr followed Jowett in asserting the 'literal' meaning of the Genesis account, and that many young-earth creationists cite Barr to support their interpretation, despite objecting to Barr's interpretation of Genesis 3 and his acceptance of the JEDP source critical documentary hypothesis. I have discussed my concerns about citing Barr elsewhere (it is ultimately an appeal to authority).<sup>3</sup>

### **Collins' hermeneutic**

Collins argues for a "linguistic-rhetorical-literary approach" (p. 29) that (he claims) does not displace the conventional tools of exegesis such as lexicography, syntax, and history. Rather, he believes his approach allows these conventional tools to function properly.

Although most scriptures are relatively easy to understand, there are undoubtedly many passages that are difficult to interpret. According to Collins, even seasoned scholars can mistakenly argue that "The author clearly says X" when they should actually be arguing that "I read this author to say X, and here is why you should too" (p. 29).

In order to demonstrate that the 'plain meaning' may not always be the correct meaning, Collins cites C.S. Lewis's 1958 denial of being a 'fundamentalist.' The term initially referred to those who subscribed to the tenets articulated in The Fundamentals (1910–1915), but in Lewis's time,

only 50 years later, the term was used quite differently. It had become a pejorative term to refer to someone who adopted a strictly literal reading of the Bible. Although Lewis objected to such labels, he still allowed for the possibility of supernatural actions and events in history, and that an account should not be dismissed as unhistorical merely because it included miracles.

Thus, Collins has two goals in this work (p. 32):

1. To provide guidance on how biblical passages relate to the findings of science; and
2. To establish patterns of good theological reading.

For Collins, many of the current approaches "suffer from a want of imagination"—they assume a way of reading a text and do not entertain whether one *must* read it that way. Thus, Collins advocates for "the *critical* use of a *disciplined imagination*". But there is only one correct way of reading a text and that is the way the author intended it to be read. Because of inspiration, a text *may* ultimately communicate more than the author originally intended (e.g. by having a prophetic aspect, by establishing a 'type', or by creating 'salvation history'), but it cannot communicate anything less! Ultimately, this can only be determined by detailed research and good judgment. One's imagination has nothing to do with it!

### **Author's intention**

Although Collins appears to accept the primacy of authorial intention and recognises that the text itself is indicative of the author's intention, he notes that this is complicated in the case of Genesis which was likely compiled and edited by Moses from multiple sources. Thus, Collins argues that authorial intention must be derived not just from the final form of the text, but also from how the ancient Israelites understood and used the text.

Curiously, Collins also acknowledges that the way later authors—especially canonical ones—understood

or used a particular text "should take pride of place in our discerning of intention; at the very least we should be reticent to set these at odds with each other". Indeed, he cites C.S. Lewis in support:

"The idea that any man or writer should be opaque to those who lived in the same culture, spoke the same language, shared the same habitual imagery and unconscious assumptions, and yet be transparent to those who have none of these advantages, is in my opinion preposterous" (p. 38).

But unfortunately, Collins himself violates this principle.

In the absence of a manual on ancient Hebrew narratology, Collins asserts that a "good" interpretive theory must satisfy four criteria:

1. It covers all the data, without fudging;
2. Other things being equal, the theory that covers the data with the fewest possible complicating assumptions is preferable (Occam's razor);
3. The theory is coherent both internally and with other things we have a right to believe;
4. The theory is fruitful, opening up fresh avenues of understanding (p. 47).

However, Collins offers no real justification for these criteria. What does he mean by "all the data"? Does it include grammatical and lexical data as well as the historical and literary context? Does it also include current scientific theories and claims? What exactly does he consider "fudging" and why? What does he mean by "complicating assumptions"? Why would a theory's capacity to open up "fresh avenues of understanding" be a necessary condition? Such a requirement would rule out any traditional/historical interpretation *a priori*. Indeed, the fourth criterion excludes one of the most important checks on the validity of one's understanding: the history of interpretation! As Collins has already acknowledged, it would be preposterous for modern readers to think their "fresh" understanding is what the author really

intended to say, when none of the leading scholars of previous generations (including the Talmudic authors) much closer in time and culture to the original author, held such views.

As noted above, Collins agrees that recovering the author's intention must be the governing principle for determining meaning. However, he rejects what he describes as the "literalistic" hermeneutic employed by Benjamin Jowett and James Barr, i.e. adopting the plain sense, natural meanings, or literal interpretation of biblical passages. Indeed, he sounds like a postmodernist when he states that the "equation [of meaning with the literal interpretation] (ironically) stands in the way of receiving the pragmatically plain sense of the biblical text" (p. 61).

Thus, Collins asserts that "poetic language tends to be more imagistic than ordinary language" and that its level of detail is often "higher than ordinary and sometimes even than scientific [language]" (p. 64). "Poetic language aims to allow the reader to imagine what it was like to see what it describes—even if what it describes is not real and even if we have no experience of the referent" (p. 63). He argues that most authors "leave it to their audiences to work out the with-respect-to-whatness of their statements; often this requires a disciplined imagination. The biblical authors are no different" (p. 71). No! Determining the author's intention requires detailed and judicious research into semantics, grammar, philology, linguistics, history, culture, and theology. 'Imagination' implies eisegesis rather than exegesis!

Collins attempts to demonstrate that recovering the author's intention does not necessarily require a literal reading. Citing Acts 2:5, "Now there were staying in Jerusalem God-fearing Jews from every nation under heaven", he notes that it would be absurd to take the reference to "every nation under heaven" literally. But this is clearly an instance of hyperbole given that the

actual nations are explicitly listed in vs 9–11. In any case, he denies that only the literalist reading Genesis is the fully consistent biblical position. For Collins, appeals to the 'plain reading' of the text show at best a superficial regard for how the text functioned in ancient Israel, second Temple Judaism, or the early church. But this is a straw man argument. YECs do not argue for a strictly literal or 'literalist' reading! We argue for the adoption of the historical-grammatical reading that takes into account word usage, figures of speech and idioms, phenomenological language, the genre of the text, and the historical and literary context. Moreover, YECs consider the way other biblical authors used the text far more significant and determinative than the way second Temple Jews or the early church used it.

Collins' straw-manning continues when he states:

"Often when a person claims to be literal he is really advocating a kind of *literalism*, which assumes a straightforward relationship between how the speaker or author conceives things to be, how he represents things in his text, and what he is



**Figure 1.** Benjamin Jowett, a 19<sup>th</sup>-century literary critic who Collins uses as a representative of the main schools of thought for examining the hermeneutical background of biblical interpretation.

actually affirming and asking his audience to accept" (pp. 96–97).

Just because YECs hold to literal creation days, does not mean or imply that we must adopt a literalist hermeneutic! We fully accept—indeed, strongly argue for—the use of phenomenological language, idioms, and figures of speech.

Even if the text has the form of historical narrative, Collins argues that the tale may be "intentionally and recognisably fictional but illustrative of genuinely existing concepts such as badness or obedience" (p. 99). But the key point here is that, in such cases, the text itself makes it clear that the account is fictional and illustrative. There are no such indicators in the Genesis account of creation.

## Genre

YECs have more recently demonstrated that Genesis is classical historical narrative, implying that the creation account is a straightforward description of actual historical events. However, Collins attempts to rebut this argument by implying that "language type is not the same as the literary form . . . That is, a piece of writing that has the literary form of a prose narrative can use ordinary, scientific, or poetic language types" and therefore "knowing the literary form does not settle all the most important interpretive questions" (p. 72). But Collins' distinction between 'language type' and 'literary' form is a mere assertion, is arbitrary, and the two concepts lack definition.

Collins asks:

"In what sense do literary form, style, and language level guide us in cooperating with the author—that is, in the illocution? Does, for example, something in the literary form of a narrative of itself purport to be a straightforward account of the 'facts'? Of course it does not. A dry style, for example, giving the appearance of straight recounting,

can convey irony or even mockery” (p. 73).

But this argument is based on English literary conventions rather than Hebrew ones. Nevertheless, although Collins asserts there is “little or even no scientific language in Genesis 1–11” but “there is a clear historical impulse behind the narrative” (p. 148), he goes on to (wrongly) claim that YECs read the account literally as a scientific description. Again, this is a straw man characterisation of the YEC hermeneutic!

Collins claims that early Jewish and Christian believers adopted a different interpretation. But this is patently false! As I have shown elsewhere, the literal day view was, before the 19<sup>th</sup> century, the predominant view.<sup>4</sup> Nevertheless, he makes much of statements by Eusebius, Augustine, Aquinas, John Calvin, and 15<sup>th</sup> century Oxford scholar John Colet referring to the Genesis account as being a ‘popular’ account rather than a scientific account, concluding that “in Genesis 1–11 we do not have even an attempt at a scientific account … meaning statements about the world that are open to investigation, to explain what things are and how they work, with technical terminology” (p. 152). But no exegetically competent YEC claims the early chapters of Genesis are a scientific account. Rather, it is a *historical* account using phenomenological language based on divine revelation.

Yet Collins believes the ‘style’ of Genesis 1:1–2:3 is ‘exalted prose narrative’ and insists that the account is filled with symbolism and anachronisms, and “aims to tell the story of beginnings the ‘right’ way, to counter the other stories” and “leaves some leeway in scientific theorizing” (p. 153). Here Collins reveals his primary motivation for his reading of the text: to insulate the creation account from any scientific and/or historical criticism. But Collins’ justification for weakening the historical basis of the account appears to be based purely on the nature of the extraordinary events recorded. In other

words, because it apparently refers to God’s unique and supernatural, creative actions, Collins asserts that it cannot be a straightforward historical account. Not only is this claim a *non sequitur*, Collins’ hermeneutic—if applied consistently—would lead to the rejection of the Gospel accounts of Christ’s incarnation, including the virginal conception, as a straightforward account since that is also a unique supernatural event. In any case, as Gerhard Hasel pointed out:

“Compared to the hymns in the Bible, the creation account is not a hymn; compared to the parables in the Bible, the creation account is not a parable; compared to the poetry in the Bible, the creation account is not a poem; compared to cultic liturgy, the creation account is not a cultic liturgy. Compared to various kinds of literary forms, the creation account is not a metaphor, a story, a parable, poetry, or the like.”<sup>5</sup>

Therefore, there appears to be no good reason to doubt that the early chapters of Genesis that discuss creation, the fall of mankind, and the global Flood are anything other than straightforward historical accounts.

### Verb forms and genre

Indeed, Steven Boyd has objectively shown, using statistical methods, that Genesis 1:1–2:3 is historical narrative.<sup>6</sup> Boyd demonstrated that the preterite verb forms used throughout the early chapters of Genesis dominate narrative texts, while perfect and imperfect verb forms dominate poetic texts. Using 96 sample texts (47 narrative and 49 poetic), Boyd was able to classify each of the texts as narrative or poetry depending on its distribution of preterites. In the case of Genesis 1:1–2:3, it was statistically classified as narrative with a probability of 0.9999. This is an extraordinary level of confidence that amounts to virtual certainty.

Yet Collins dismisses this research because Boyd’s understanding of

‘genre’ does not make distinctions between “literary form, social function, style, and register … [and] language types … . The literary form is *narrative*, while the style or register is *exalted prose*” that leans “toward the poetic side of the spectrum” (pp. 156–157). By ‘literary form,’ he means what we currently understand as genre (e.g. narrative). By ‘register,’ he means the linguistic constraints imposed on the text with respect to the grammar, syntax, and vocabulary used to communicate in a particular field of knowledge (e.g. genealogy). ‘Style,’ on the other hand, refers to the features of the text that distinguish the author (e.g. John’s Gospel has a very different style to Luke’s). But none of these elements demand or imply that a narrative text may be more poetic and not a straightforward historical account.

Genesis 1:1–2:3 is formally no different to the rest of Genesis 1–11 and no different to Genesis 12–50. The entire book has all the syntactic and stylistic markings of classical historical narrative. “Exalted prose” (and other similar terms) is an artificial genre invented by scholars who refuse to acknowledge that the account is a straightforward description of God’s supernatural actions in history.

### Literary and historical context

V. Phillips Long warns:

“Genre criticism must resist the temptation to focus exclusively on smaller units of discourse and instead must be alert to the way in which the genre of a larger discourse unit affects every smaller discourse unit within it . . . It is not wrong, of course, to study the smaller units; it is indeed useful and necessary. But final judgment on a smaller unit’s import, historical or whatever, must not be passed without first considering the larger discourse of which the smaller is a part.”<sup>7</sup>

Although Collins accepts that Genesis 1–11 is an integral part of the whole structure of Genesis, organised

by the *toledot* (“account of”, “what follows from”) sections, he still views these chapters as standing “somewhat separately” (p. 113), functioning as a kind of preface. Similarly, he considers Genesis 1 to be a kind of preamble to the whole book.

As I have shown elsewhere (see figure 2), each ‘account’ carries on the story of a subject mentioned in the preceding account. Thus, Genesis 5:1–6:8 records the family line of Adam who had already been explicitly identified in the preceding account (Genesis 2:20). But in the case of Genesis 1, there is no preceding account, so we would not expect to find the same *toledot* starting formula.

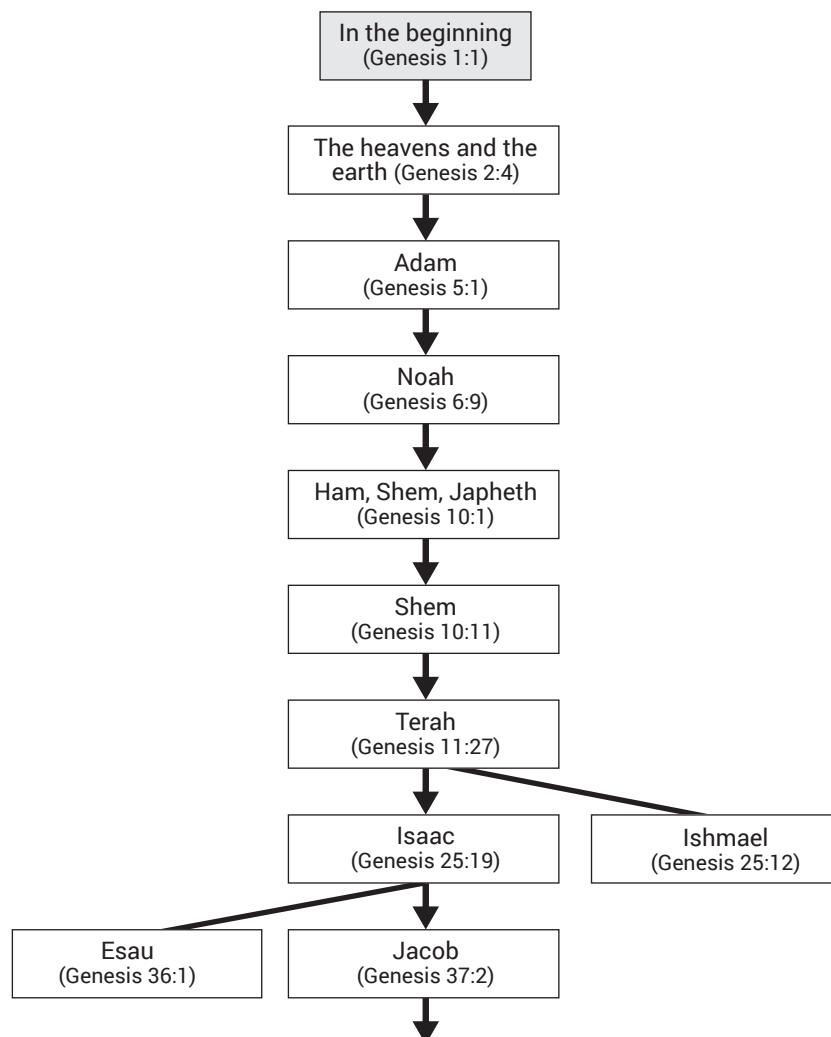
By placing the creation account at the very beginning of the book, the author emphasises that God is the source of everything and created *out of nothing*, because there was no person and no thing present in the beginning from which the creation could be derived.<sup>8</sup> This explanation not only makes sense logically, but neatly fits the literary context of both the early chapters and the whole book.

Collins argues that although there is no real grammatical break between Genesis 11 and Genesis 12, there is a clear literary break because the timeline slows down as we begin the account of Abram and his descendants. But a change in the amount of time covered

by the narrative is hardly a change in literary style. The author may simply want to quickly and broadly establish the ancestral heritage of the people they focus on or discuss.

Literary context also includes—as Collins acknowledges—other scriptures that refer to the text or the same theme, and that this may shed light on the text. But Collins more or less ignores such texts—especially those that refer to the creation account as literal history.

Regarding the historical context, Collins follows many others in suggesting that Genesis has parallels with other Ancient Near-Eastern creation stories, and asserts that although we may categorise them as ‘history’ no one expected these stories to be read in a thoroughly literalistic fashion. But when compared to Genesis, other Ancient Near-Eastern creation stories have more differences than similarities. Therefore, it does not follow to use these other accounts to interpret Genesis.



**Figure 2.** The ‘accounts’ of Genesis. Each account carries on the story of a particular subject mentioned in the preceding account.

### A ‘rhetorical-theological’ reading

Collins views Genesis 1–11 as the pre- or proto-history to the Christian ‘big story’ that answers where we came from, what the good life looks like, what went wrong, what the consequences were, where we are now, and where we are headed. Apart from being pre-history, YECs would generally agree with this view. But Collins’ ‘rhetorical-theological’ reading goes further in denigrating the historical correspondence of the Genesis account.

Grant Osborne points out the dangers of such literary critical approaches: (1) Tendency to de-historicise; (2) Setting aside the author; (3) Denying intended or referential meaning; (4) Reductionistic and disjunctive thinking; (5) Imposition of modern literary categories; (6) Pre-occupation with obscure theories; and (7) Ignoring the early church’s understanding.<sup>9</sup> As I will show, Collins is guilty of them all.

### Tendency to de-historicise

Collins shies away from accepting Genesis 1–11 as being what he designates ‘antiquarian history,’ where

“... a narrative conveys history only when it is straightforward and factual; that is, only when it aims at historical verisimilitude ... . This notion therefore expects that the poetic elements are minimal and that the preferred language level is on the range from the ordinary to the scientific” (p. 139).

Instead, he asserts it is “rhetorical history”. Although he claims it does not describe historical events, it still “refers” to “actual persons and events”. He insists “that ‘history’ is not a literary form; it is rather a way of referring to persons and events with a proper moral orientation” (p. 141).

### Setting aside the author

Despite claiming to honour the author’s intention, Collins claims “the Pentateuch presents itself as normative rather than empirical” and forms the constitution of Israel as a church-state nexus:

“But if it is a constitution, is a most odd one, since it has laws in the context of a narrative that tells Israel where it came from, how God got them to where they are, and what purpose God has in mind for them as people (blessing of the nations). Once we acknowledge that, then we see that our hermeneutics should derive from this social function, this shaping of an identity, this forming of a worldview based on a big story ... . That is, our hermeneutic should begin with how this literature functions in a social system, asking questions about social and linguistic conventions for carrying out those functions” (pp. 133–134).

Thus, for Collins, the primary hermeneutic should be based on the speculation of how the text was used in the audience’s society, rather than what the author actually sought to communicate.

### Denying intended or referential meaning

Collins repeatedly denies the simple referential meanings in Genesis 1–11, claiming these chapters are different from the following patriarchal stories. He sees ‘anachronisms’ (i.e. use of terms that would make sense to the audience but not to the supposed author) as an essential feature of the text’s style. This results in Collins getting everything exactly backwards!

According to Collins, the Garden of Eden is really an analogy or homology of the Tabernacle and its furnishings, and the ‘Promised Land’ is a kind of reconstituted Garden of Eden. Adam is a kind of ideal Israelite and because his and Eve’s speech employs Hebrew wordplays (Genesis 2:23; 4:1, 25); this is another anachronism. Likewise, the reference to clean and unclean animals (Genesis 7:2, 8) precedes the specification of clean and unclean animals in Leviticus 11. However, Collins does not consider the possibility that God revealed to Noah which animals were clean and unclean, and, in any case, Genesis 7:9 states that the clean and unclean animals *came* to Noah so he was not required to make any distinction. Furthermore, humans were meant to be vegetarian until after the Flood (Genesis 9:3), so the difference could not have been dietary as it is in Leviticus.

In addition, Noah’s burnt offering (Genesis 8:20–21) reflects the Mosaic burnt offering (Leviticus 11) so “Genesis interprets Noah’s behaviour in line with Israelite practice” (p. 146). But it is just as reasonable to view Noah’s burnt offering as foreshadowing the burnt offering of the Mosaic covenant.

For Collins, the account of Cain and Abel “serves the purposes both of showing the downward trend of humankind after the disobedience of Genesis 3, and of reinforcing the importance of worshipping from the heart” (p. 145). This is nonsense. The account is the beginning of the progressive revelation through salvation

history that atonement for sin requires a blood offering. It sets the scene that the wages of sin is death and prepares the way for Christ’s sacrificial death.

Similarly, Collins is sceptical of the historical correspondence of the ground/land referred to in Genesis 2:6, and views it and the Garden of Eden as anachronisms:

“The land here, in which God forms the man before translating him to the garden, is unnamed ... it is not clear whether this is a strong claim of the historical location or simply a literary device that recounts the events in terms familiar to the audience” (p. 147).

Noting the presence of gaps in the genealogies of Matthew’s Gospel for rhetorical purposes, Collins attempts to extend the interpretation to Genesis 5 and 11. He concludes that providing “an exhaustive list was not the purpose of such genealogies either in Matthew or in Genesis” (p. 182).

Regarding the long lifespans in Genesis 5 (from 777 to 969, not including Enoch’s 365 years), Collins suggests “there is reason to believe that some kind of symbolism is at work” (p. 182), rather than the text presenting actual lifespans.

Unsurprisingly, Collins denies the days of creation correspond to actual literal historical days. Rather, he claims the days are ‘analogue’ and the “text grammatical features are entirely non-committal as to how long before the work week the whole universe is supposed to have come into being” (p. 163). Yet the reference to the creation of the first man and woman in Matthew 19:1–5 and that God intended them to marry “from the beginning” should remove any ambiguity. Moreover, he argues that the interpretation of the seventh day—the Sabbath rest (Genesis 2:2–3)—should be driven by the lack of a terminating “there was evening and there was morning” refrain, and that an Israelite reader would have understood that God does not get tired and therefore would have inferred that the day is analogue:

“God’s work and rest are *like* human rest and work in some ways and *unlike* it in other ways . . . That is, these creation days are God’s work days, and, since the divine Sabbath does not correspond in length and character to a human Sabbath, we need not concern ourselves with the exact relationship of this work week to a human work week (p. 163).

However, this argument is fallacious, as I have shown elsewhere.<sup>10</sup>

#### Reductionistic and disjunctive thinking

Collins’ reductionism starts with his assertion that the primary purpose of the Genesis account as “opposing the origin stories of other ancient peoples by telling of one true God who made Heaven and Earth, and who dignified humankind with a special nobility” (p. 137). This is a common view among non-YECs, but it does not do justice to the detail, structure, and context.

Collins adds: “[T]he passage is silent about what sorts of processes are said to be involved in this work week (such as how the plants and animals came to be in their distinct ‘kinds’); it does not say whether there were, or were not, any processes” (p. 165). But Collins’ commitment to his analogical view and his assumption that alternate views must offer a ‘scientific’ explanation for the events have blinded him to the obvious! The creation account makes the process abundantly clear: “God said . . . and it was so.”

Similarly, Collins argues that attempting to determine how long it would have taken Adam to name all the animals is not what the author intended, because he offered no help with respect to timing. But no chronological help is required because an approximate time can easily be calculated.<sup>11</sup>

#### Imposition of modern literary categories

Collins’ appeal to text styles such as ‘exalted prose’ and ‘language level,’ and his insistence on the employment of anachronisms in the interpretation of

Genesis 1–11 are examples of imposing modern literary categories onto an ancient text.

Virtually all standard texts on biblical hermeneutics and exegesis identify seven distinct genres: (1) historical narrative; (2) poetry; (3) prophecy; (4) wisdom literature; (5) parables; (6) epistles/letters; and (7) apocalyptic literature.<sup>12</sup> ‘Exalted prose’ and ‘language level’—whatever these terms mean—are not appropriate for sound biblical interpretation.

Anachronisms are defined as later writers describing or referring to historical people, places or events using modern categories, e.g. describing Viking invaders as commanding a battleship. But in the Pentateuch, Moses was largely writing about contemporary events. In the case of Genesis, the historical accounts most like a combination of oral tradition and divine revelation, and for the creation account itself, it was clearly a product of divine revelation given that no-one was actually present at the time. In any case, most biblical scholars deny the presence of anachronisms in Scripture. Alleged anachronisms are only ‘apparent’ and can be easily explained upon further investigation.

#### Pre-occupation with obscure theories / Ignoring early church’s understanding

Collins stands alone in holding to his ‘analogical days’ view. Moreover, the history of interpretation stands squarely against him. No other interpreter—Jewish or Christian—held any such view,<sup>13</sup> and Collins virtually ignores their commentary.

#### Conclusion

Like Collins’ other books in this area, there is a great deal of bias in this work and it does not fairly represent other views and interpretations. It is replete with straw man arguments and attacks—especially in relation to his characterisation of the literal day view of the Creation Week, and the way

he repeatedly equates the literal day view with a ‘literalistic’ reading and hermeneutic.

Collins advocates for an alternative—albeit obscure—reading of the Genesis account of creation, yet never considers the possibility that the scientific data may also have an alternative interpretation.

In any case, this book will not help you ‘read Genesis well’ and should have been titled *Reading Genesis Badly!*

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# Thermal history of the Fenton Hill site

Dr Russell Humphreys recently wrote an article in this journal addressing me as a ‘persistent critic’ of his RATE helium research.<sup>1</sup> Since it is not possible for me to respond to all of his errors and misleading statements in this short letter, I will focus only on his interpretation of the thermal history of the Fenton Hill site. Humphreys goes to great length arguing for hotter past temperatures of the site for his uniformitarian model, using references by Kolstad and McGetchin<sup>2</sup> and Sasada<sup>3</sup> as his primary sources. Regardless of the merits and demerits of his model, Humphreys fails to apply the logical consequences of his own arguments towards his young-earth creation model. Let us consider these consequences.

First, Humphreys says regarding his young-earth model: “I knew that temperatures in the formation could not naturally change much in only thousands of years.” I agree. Then how does Humphreys explain the high-low-high temperature history of Sasada? Even if we allow his invalid swapping of the past temperature maximum with the temperature minimum,<sup>4</sup> his model still has to explain a past event when the temperature was higher than today, and a past event when the temperature was lower than today. How can he do that if, as he says: “temperatures in the formation could not naturally change much in only thousands of years”? Humphreys cannot have it both ways. If Sasada is right, then his young-earth model is wrong. If Sasada is wrong, then he has no grounds in citing it against my work.

Now consider what Humphreys says about the Kolstad paper:

“Kolstad and McGetchin’s simulations show that temperatures can’t change all that fast (over a few

thousand years) in this particular formation. That’s because the rock is dry, so heat can move only by conduction, which is quite slow in rock.”

Then how does Humphreys explain the present high temperatures at the Fenton Hill site? It could not have been from the eruption of the volcano which formed the Valles Caldera, since this Cenozoic geologic event would be placed in the post-Flood era in most young-earth models. From Kolstad and McGetchin’s simulations, 4,500 years is not enough time for heat from a deeply buried magma chamber to reach the site of the geothermal wells. Indeed, since Humphreys uses a time span of 6,000 years for his diffusion model and not 4,500 years, he is tacitly assuming that the Fenton Hill site was already at its present elevated temperatures *before* the Valles Caldera erupted. How can this be? The Fenton Hill site was the subject of intensive geothermal research because the rock there is so much hotter than typical areas around the world. Was it created unusually hot during Creation Week, and a volcano just happened to coincidentally erupt nearby after Noah’s Flood? The big dilemma faced by Humphreys’ helium diffusion model is not explaining how these zircons could retain helium at their current elevated temperatures. Rather, it is in explaining why the zircons are so hot in the first place.

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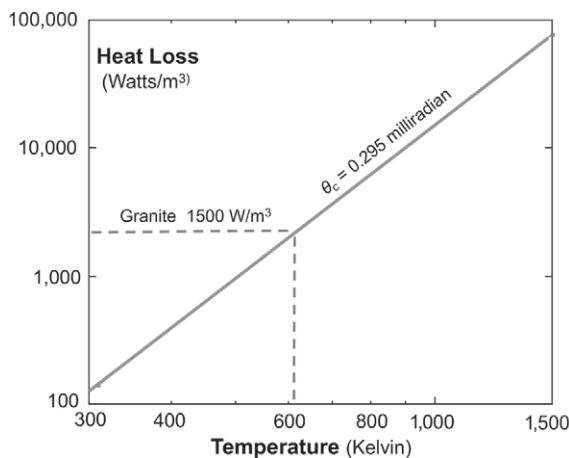
- One cannot arbitrarily re-order thermal events in the Sasada thermal history just because the time axis is displayed in arbitrary units. The relative order of events in the fluid inclusion study can be determined uniquely, just as in geology, through cross-cutting relationships and similar arguments. The following quotes from Sasada makes the order of events unambiguous: (1) “Calcite vein precipitation: Since fluid inclusions in calcite stretch above  $T_h$  more easily than do those in quartz, the primary inclusions in the calcite must not have formed before the re-equilibration of the secondary inclusions in quartz. Hence, the veinings of calcite are younger than the re-equilibration of the secondary inclusions in the host rocks”; and (2) “Secondary inclusions in calcite veins: Secondary inclusions were formed by healing the fluid-filled fractures during the cooling process after the formation of primary inclusions.”

## » Russell Humphreys replies:

I appreciate Dr Loehelt’s letter because it gives me an opportunity to explain two neglected factors that help determine the temperature history of rocks in the earth. The two factors are: (1) *accelerated nuclear decay*; and (2) *accelerated volume cooling*, both during the Genesis Flood and before it. Neither factor occurs *naturally*, which is the qualifier Loehelt seems to have missed in my statement, “temperatures in the formation could not *naturally* change much in only thousands of years” (emphasis mine).<sup>1</sup>

The RATE research initiative (which included the helium project Loehelt is criticizing) offered several lines of evidence for each factor.<sup>2</sup> The first factor would account for about 500 million years of nuclear decay occurring within the one year of the Genesis Flood, an acceleration factor of half a billion. That would increase the heating due to radioisotope decay occurring in granite today, about 3 microwatts per cubic metre,<sup>3</sup> to about 1,500 watts per cubic metre. If operating by itself, the first factor would raise the temperature of granite by 100° in 36 hours.

However, the first factor (accelerated nuclear decay) was not operating by itself. RATE also found observational evidence that the entire volume of each rock was cooled supernaturally fast during the Flood, and probably



**Figure 1.** Amount of accelerated volume cooling depends on the absolute temperature of the object and on the degree of opening into hyperspace.

before it.<sup>4–6</sup> At the 2018 International Conference on Creation I presented a new theory<sup>7</sup> for how the cooling would occur, namely by thermal radiation into ‘hyperspace’ from the entire volume of each rock while the ‘windows of heaven’ were open during the Flood (and other times). The cooling rate would depend on the fourth power of the temperature of the object being cooled, and on the degree of opening at infrared and visible wavelengths. Figure 1 shows the heat loss for a small degree of opening. The heat loss is insignificant for low temperatures (thus not being a burden on living creatures aboard Noah’s ark), but it is quite significant for hot rocks.

Regardless of whether my theory is correct or not, I emphasize that RATE found *observational* evidence that accelerated volume cooling has taken place.

The rates of the two processes were probably neither constant nor proportional to each other. For example, I think the rate of nuclear decay was high at the outset of the Flood, and lower at the end of it. The rate of cooling was probably lower at the beginning of the Flood and higher at the end. I also think the two effects were at work, though at a lower

intensity, during the Antediluvian age (between the Fall and the Flood).<sup>8</sup> Using the two processes, God could adjust temperatures in the rocks to whatever He wanted—temperatures both rising and falling, during both periods, the Antediluvian age and the year of the Flood. The maximum and minimum temperatures Loechelt reports could easily

have happened during those periods. My guess is that shortly after the Flood, the temperatures in the formation were about what they are today. That would fit the helium retention data we have.

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## Flood–post Flood boundary

In Michael Oard’s recent article on the Flood–post Flood boundary in volume 33(2), 2019, he described how John Whitmore attributed so much of geomorphology to post-Flood processes. A major biblical difficulty with this is that in II Peter 3:5–6 we are told that in the last days people will be willingly ignorant of Noah’s Flood.

But how could anyone be willingly ignorant of something for which there is so little evidence, which would be the case if so much of what we see on the surface of the earth was caused by local events? And if that is the case, then would it not be reasonable to ascribe geological features beneath the surface, such as we can see in the strata of such rare localities as Grand Canyon, also to local catastrophes?

If the extremely broad planation surfaces we see all over the world today were all believed to have been caused by local catastrophes, then why not attribute the extensive subterranean strata to local catastrophes, as well?

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# The Great Oxidation Event or The Great Phytogenic Event

Greg N. Bender

Scientists famous for their work elucidating the biosynthetic pathway of chlorophyll believe that photosynthesis is an ancient process that evolved billions of years ago, that anoxic photosynthesis preceded oxygenic photosynthesis by millions of years, and that a more primitive form of photosynthesis evolved into the extremely complex biochemical pathway of photosynthesis we see today in higher order plants. Biblically, they would be simultaneous events. The secular paradigm goes through the lengthy process of ‘evolving’ a large series of parallel biosynthetic pathways to come up with the enzymes needed to convert glutamine to chlorophyll, which doesn’t appear to be statistically possible given the conventional 3–4 Ga of trial and error. There are intermediate products along the biochemical pathway to chlorophyll that are required at earlier levels in the chain to direct chlorophyll biosynthesis, such as chlorophyllide-a. Critical for the evolution of chlorophyll would be the coordinated need for a protective mechanism against oxidation from the intermediate products. This paper discusses in detail these four issues that actually better demonstrate God’s creation through His Word, Jesus, as a much better answer for what happened 6,000 years ago.

“... for people who are not omniscient, the Bible is necessary for certain knowledge about anything”.<sup>1</sup>

The Great Oxidation Event (GOE), the hypothesis of when and how oxygen was introduced into the earth’s atmosphere, was given concept by Heinrich Holland.<sup>2</sup> The GOE is largely supported by the mere weight of the subsequent hypotheses in the literature that stem from it, most assuming the GOE is already an established fact. Hypotheses about the visible red layers of iron oxide in the geologic record, isotope variance in ice cores from Greenland and Antarctica and the enlistment of cyanobacteria as the principal agent deemed present in the fossil record in stromatolites all stem from the concept of a sacrosanct GOE.<sup>2–5</sup>

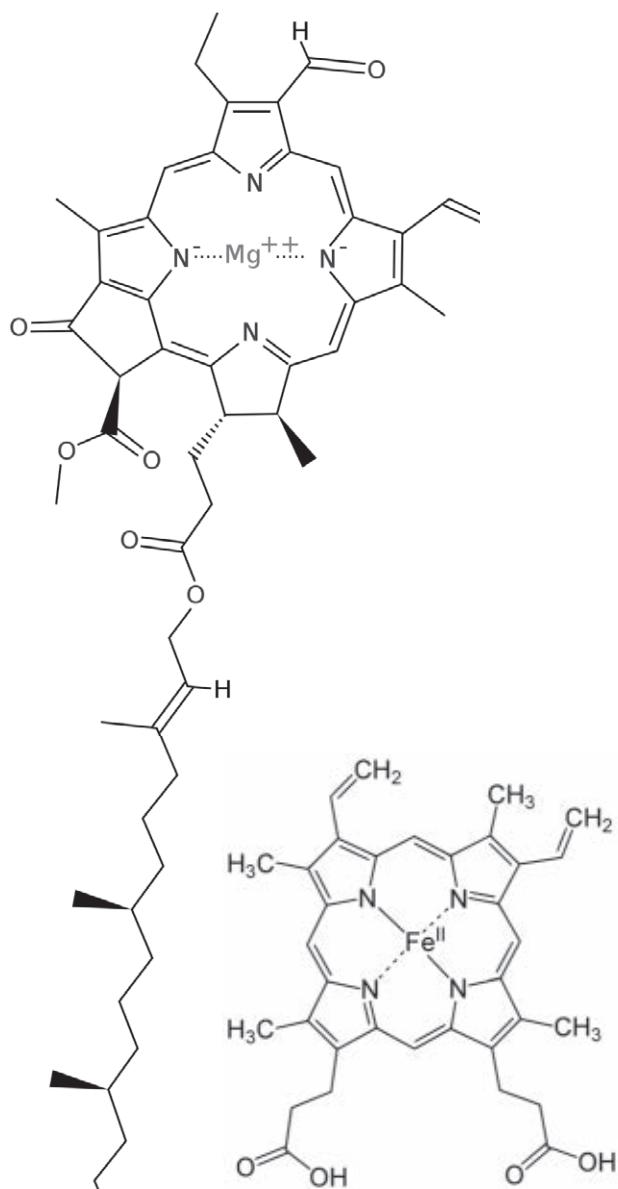
To have oxygenic photosynthesis, and therefore a GOE, the underlying biosynthetic pathway of chlorophyll must first be addressed. Four issues would have to be overcome by evolutionary processes even before the end product of chlorophyll is produced. Dr Tanja Bosak of MIT, and Dr Blankenship not only believe that photosynthesis is an ancient process that evolved billions of years ago prior to the GOE, but that anoxic photosynthesis proceeded oxygenic photosynthesis by a billion years. This hypothesis would require a more primitive form of photosynthesis to evolve into the extremely complex biochemical pathway of photosynthesis that we see today.<sup>6</sup> The conventional paradigm also goes through the lengthy process of ‘evolving’ a large series of parallel biosynthetic pathways to come up with the enzymes needed to convert the amino acid glutamine to chlorophyll. This doesn’t appear to be statistically possible given only 3–4 Ga of trial and error. There are also

intermediate products along the biochemical pathway to chlorophyll that would be required at earlier levels in the chain to direct chlorophyll biosynthesis. Chlorophyllide-a, for example, would be required before evolution of the main pathway could proceed. Critical for the synthesis of chlorophyll to have begun within a membrane enclosure would be a protective mechanism against oxidation and death from the intermediate and final products it was evolving towards.

If none are possible, it is logical that a ‘Great Phytogenic Event’ of creation, as opposed to a GOE, occurred by design, created *ex nihilo*, with photosynthesis assembled and started in its complete cyclical form on the 3<sup>rd</sup> day of creation, within chloroplasts, utilizing chlorophyll-a, chlorophyll-b, bacteriochlorophyll-a or bacteriochlorophyll-b. It would appear that on the 5<sup>th</sup> day, marine bacteria and thermophiles were created using both oxygenic and anoxic photosynthesis. The branch point of this biochemical chain of reactions, at protoporphyrin IX, would then be redirected on the 6<sup>th</sup> day as a complete biosynthetic pathway to produce hemoglobin for animals with vascular systems. New intermediates would again need to act as tugboats to steer the reaction of Fe<sup>2+</sup> incorporation into the base tetrapyrrole design, the molecular backbone of both chlorophyll and hemoglobin (figure 1).

## Anoxic photosynthesis and oxygenic photosynthesis

The idea that anoxic photosynthesis preceded oxygenic photosynthesis falls neatly into the overarching concept of the Great Oxidation Event (GOE). The GOE is the era



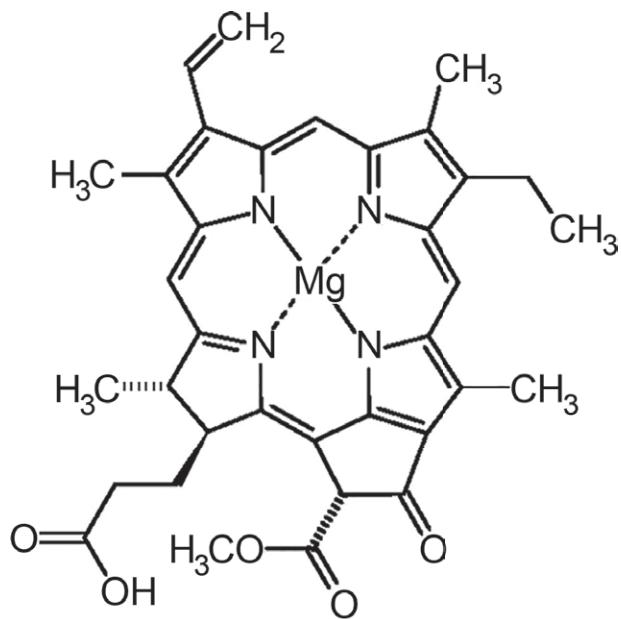
**Figure 1.** On the left, chlorophyll-b is a serious oxidizing agent when in excess. On the right is Fe-porphyrin subunit of heme B, from hemoglobin. Both have a common tetrapyrrole precursor in porphyrin-IX. Note the central magnesium atom in chlorophyll-b and the central iron atom in the Fe-porphyrin subunit. Each requires a separate pathway from porphyrin-IX for inclusion.

where a spill-over of primitive archaean or cyanobacterial oxygen production filled our atmosphere after ocean and land assimilation had reached capacity. A pre-GOE earth is said to have had methane, ammonia, hydrogen, helium, and water (as a vapour). Since there is no oxygen in this prebiotic, Urey-Miller milieu, evolutionists believe that anoxic photosynthesis must have come first by default. When enough carbon dioxide was generated through volcanic activity and dissolved into the oceans, the last universal

common ancestor (LUCA) laboriously evolved on the use of  $CO_2$ ,  $H_2O$ , and sunlight or heat. The byproduct of  $O_2$  was first soaked up by all of the ferrous compounds for millions of years until saturated. It was then that our atmosphere became the repository for the spill-over of oxygen. This oxygen was now available from another set of cells, whether Archaean or Cyanobacteria in origin, that built upon the anoxic cycles that were contained within LUCA's phospholipid membranes. These primitive bacteria evolved more and more complex photosynthetic biosystems by informing each other of the most recent upgrades through gene transfer. This paved the way for eukaryotic egress into evolution.<sup>7</sup> Of course, the first black box is how photosynthesis started to begin with, and how its primary molecular component, bacteriochlorophyll, came into being. To jump over this step in the evolutionary mantra makes the whole evolutionary process look easy. Digging into the details of this step, however, we see it is impossible.

The lack of an evolutionary process between anoxic photosynthesis and oxygenic photosynthesis is supported by Dr Tanai Cardona, who indicates the two processes actually represent separate evolutionary events. Lateral gene transfer between bacteria utilizing anoxic photosynthesis has been demonstrated. However, there has been no documented evidence of lateral gene transfer of templates for complete oxygenic photosynthesis between bacteria or eukaryotes utilizing oxygenic photosynthesis and those that do not.<sup>8</sup> These studies, so far, eliminate any mechanism to breach the anoxic to oxygenic gap. Cardona goes on to say that there is evidence that oxygenic photosynthesis actually preceded anoxic photosynthesis.<sup>8</sup> If true, then it appears evolutionists are getting closer to the creation paradigm with near, if not simultaneous, creation of bacteria having both processes immediately available for energy production.<sup>9</sup>

In October of 2008, Meng *et al.* reported, in the ISMA *Journal of Microbial Ecology*, that they found in river sediment an Archaeal 16s rRNA gene which contains transcript information for a bacteriochlorophyll-a synthase (*bchG*) gene.<sup>10</sup> This was evidence that the modern complex biochemical pathway for bacteriochlorophyll was already present in Archaea, thought to be the oldest life-form. Evolutionists give Archaea the distinction of being one of three original cell types which predated bacterial development 1–3.5 Ga ago. Blankenship has hypothesized that the earliest form of photosynthesis was most likely contained within the membrane of these types of early cells. This, he says, was with a very primitive form of photosynthesis, using iron-sulfur electron receptors from a soluble  $Fe^{2+}$  donor, predicated on the fact that our early oceans contained large concentrations of ferrous materials.<sup>5</sup> The report from Meng Jun *et. al* would invalidate that hypothesis with evidence that a modern-day, sophisticated biochemical pathway already



**Figure 2.** Chlorophyllide-a is an important facilitator in the biosynthesis of protoporphyrin-IX to Mg-protoporphyrin IX. It is also a photosensitive pigment.

existed in those cells from the onset, with complete enzyme production and encoding. Others consider the primitive origin of photosynthesis began in cyanobacteria. As Bosak said of her study of the GOE in the context of fossil stromatolites: “Really, oxygenic photosynthesis [from cyanobacteria] came up as the only likely candidate” [integral to the GOE, allowing eukaryotic life on earth].<sup>6</sup>

Surprisingly, Blankenship, in his text on Molecular Mechanisms of Photosynthesis, counters this line of evolutionist thinking by stating:

“There is something of a paradox concerning the early fossil evidence for photosynthesis … the earliest known direct evidence for life on Earth is almost certainly photosynthetic, and such organisms are often interpreted as closely related to cyanobacteria. Cyanobacteria are remarkable complex cells in terms of photosynthetic capability, and they do occupy an early branching position on the tree of life [2.4 Ga ago]. It is inconceivable that the cyanobacteria were the first photosynthetic cells, as they contain most of the innovations that characterize the most advanced forms of photosynthesis.”<sup>5</sup>

Creation scientists, focused on identifying ‘modern’ phototrophic biochemical pathways with genetic coding of the necessary enzymes in Archaea or primitive bacteria, especially in fossilized form, could provide closure to this argument. If found in the most ‘primitive life forms’ then the simultaneous occurrence of anoxic and oxygenic photosynthesis is likely.

Even more likely would be that those life-forms are not ‘primitive’ and photosynthesis was not a product of evolution!

### End-product existence before pathway evolution

Is it possible to evolve a biochemical pathway when one of the future intermediates is responsible for directing the more primitive pathway toward the evolutionary development of that future intermediate? Dr Gerhard Michal, who is famous for those wonderful, intoxicating charts of the biochemical pathways of life that are every graduate or medical student’s wallpaper, gives clear detail to the biosynthetic pathway from protoporphyrin IX to chlorophyll in his invaluable 2012 handbook *An Atlas of Biochemistry and Molecular Biology*, co-edited with Dr Dietmar Schomburg (p. 90). Five enzymatic steps down the page is the intermediate product, chlorophyllide-a (figure 2). It is also pictured as a necessary component, with the enzyme Mg-protoporphyrin-a chelatase, to steer the enzymatic reaction of protoporphyrin IX to magnesium (Mg) protoporphyrin IX. Chlorophyllide-a may act as a Mg<sup>2+</sup> donor when in excess. It may act as a Mg-compound concentrate, or to augment an enzymatic domain in the cellular milieu by promoting the availability of Mg-protoporphyrin-a chelatase in the enzymatic reaction responsible for incorporating the Mg<sup>2+</sup> molecule into protoporphyrin IX. This in exchange for two hydrogen atoms. It is certainly required to prevent other metals, such as Fe (iron), Co (cobalt) or Ni (nickel) from competing for that central spot in this tetrapyrrole substrate. That key role comes from the importance of protoporphyrin IX being the precursor for hemoglobin and B12 vitamins (neither of which are photosensitive pigments like chlorophyll) and iron being a much more common element than magnesium in hundreds of more available compounds (figure 2).

The conundrum of using a future intermediate in directing a more primitive pathway toward developing that intermediate might be addressed by both evolutionists and creationists in one of three ways. Evolutionists could point to either the retrograde hypothesis of Horowitz or the Granick hypothesis.<sup>3,5</sup> Creation scientists would employ Dr Michael Behe’s hypothesis of ‘irreducible complexity’.<sup>12</sup> The question is, which of the three would be possible?

The retrograde hypothesis would suggest that, beginning with chlorophyll, evolution would work backwards to supply the components as needed. If chlorophyllide-a was a pre-existing molecule during the evolution of the protoporphyrin IX to Mg-protoporphyrin IX reaction, to produce chlorophyllide-a, then there would be no biological need to develop the pathway to begin with. Biochemical evolution is still based on the survival of the fittest, the fittest being the most efficient, lowest energy chemical pathway

that produces critical end products that further promote a closed system, protecting it from entropy. If evolution were to work backwards from this point, in an attempt to attain the lowest energy pathway within a closed system, which would eventually be chlorophyllide-a, then no reaction at all would be the lowest energy solution since the intermediate would already exist.

Although the Granick hypothesis is applicable when biochemical reactions progress from A to B to C, it is not applicable when C is needed to produce B before the reaction from A to B has evolved.

"In [the definition of the Granick hypothesis], each intermediate in the modern pathway was at some point the end point in the pathway [during pathway evolution]. This requires that each intermediate in the modern pathway must be usable in the past as an end product."<sup>5</sup>

Chlorophyllide-a is a photosensitive intermediate that may have functioned as an end point in the early evolution of the pathway. The same is true for its precursor, protochlorophyllide-a. It is highly unlikely that protoporphyrin IX or Mg-protoporphyrin IX could serve as temporary end points. In the evolution of a photosynthetic pathway, using the Granick hypothesis, every intermediate, by definition, would have to be photosensitive.

The third and most plausible explanation is that given by Behe of Lehigh University. *Irreducible complexity* describes systems that have an 'all or nothing' ability to function based on the presence of all of the components being ready to function at once. If one is absent, the whole pathway simply will not work.<sup>12</sup> This implies premeditated design of the entire pathway with a credible and usable endpoint. Assembly and concentration of all its components would need to be concurrent, and initiation of the pathway would occur only when it is complete and set to perform, with a template for reproducibility to go with it.

This explanation fits hand in glove when intermediate products are used to mediate pathways prior to the production of molecules of the same kind. Chlorophyllide-a, co-opting the subsequent biochemical pathway, guiding protoporphyrin IX to Mg-protoporphyrin IX, does not require the same concentration of chlorophyllide-a as subsequently produced by that pathway. However, chlorophyllide-a still needs to exist as a specific molecular entity before the entire pathway is activated, which it would if the entire cycle was assembled and encoded before activation.

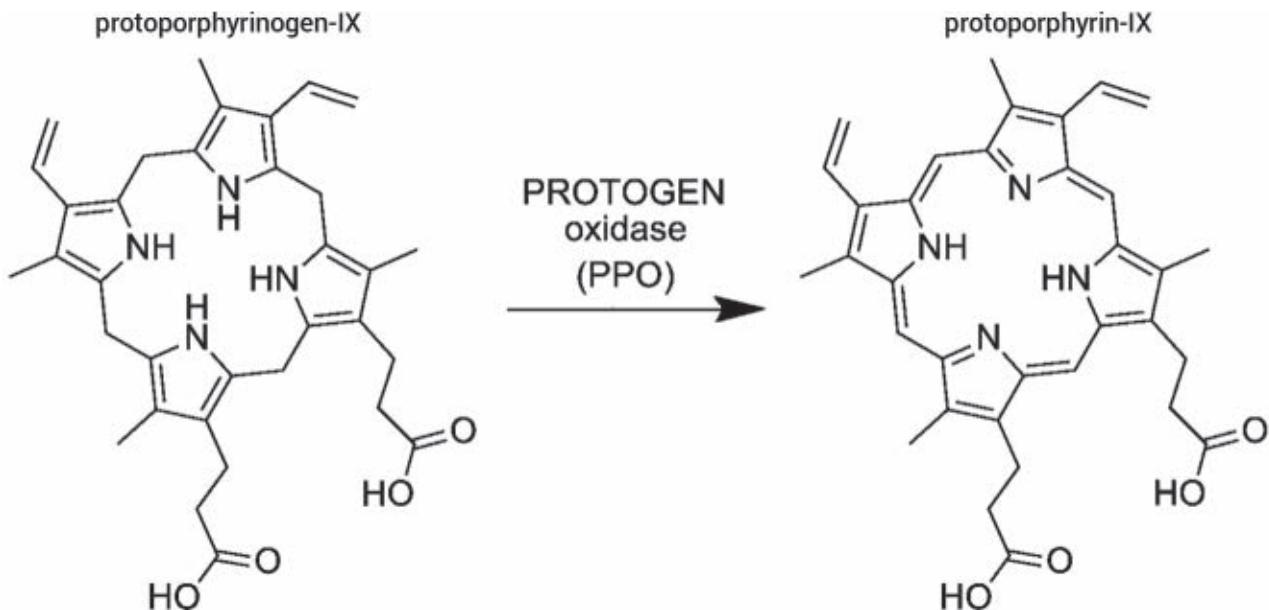
### **Multiple parallel evolutionary processes can unite to produce a single pathway.**

Is it possible to evolve a multistep biosynthetic process through independent evolution of the required enzymes

to ultimately produce chlorophyll? Enzymes are proteins that are coded along a specific gene in plant or bacterial DNA. To produce the enzyme, DNA must be transcribed to mRNA, which utilizes a ribosome to produce the required protein from the mRNA template. This dogma of life gives us the 20,000 proteins in human cells, many of which are enzymes for biochemical pathways. Enzymes facilitate the individual steps along a biochemical pathway to ensure the most efficient and accurate construction of intermediate or final products, such as chlorophyll-a and chlorophyll-b. It would otherwise take incredibly long periods of time for seemingly simple reactions, like hydrolysis, to occur between each step.

Despite the controversy around the evolution of the complete biosynthetic pathway allowing a full cycle of photosynthesis from sunlight to glucose, bacteriochlorophyll and chlorophyll are still the primary photosensitive pigments. Chlorophyll is a complex molecule that is closely related to the oxygen-carrying portion of hemoglobin, 'heme'. They share a portion of the pathway involved in the biosynthesis of tetrapyrroles, their biosynthetic branches diverting following the conversion of uroporphyrinogen III to coproporphyrinogen III to protoporphyrin IX.<sup>11</sup> Following the diversion of the pathway, well beyond protoporphyrin IX, light-sensitive chlorophyllide-a is converted to chlorophyllide-b utilizing the reductant NADPH and O<sub>2</sub>. In turn, both chlorophyllide-a and chlorophyllide-b are converted to chlorophyll-a and chlorophyll-b, respectively, through enzymatic reaction with chlorophyllase, a complex protein molecule with multiple domains. Similarly, Mg-protoporphyrin IX chelatase is a complex protein with multiple domains that brings the magnesium molecule into the porphyrin ring during the conversion of protoporphyrin IX to Mg-Protoporphyrin IX.<sup>11,13</sup>

Seventeen enzymes of complex molecular structure are needed through the 18-step chain of events towards chlorophyll construction from L-glutamate, in addition to the use of ATP/ADP, the reductant NADPH/NADP, and 2 Co-factors. All of these have separate biochemical pathways of production or conversion.<sup>11</sup> In 1976, Dr Jensen described an evolutionary process called 'gene recruitment', whereby the evolution of enzymes is a gradual, step-by-step process in substrate recognition and reaction upon a substrate, producing better intermediates or final products. This process positively reinforces itself, through gene transfer, by incorporating any improvements in enzyme specificity and function into cellular DNA. This allows for the reproduction of any improvements into the next cycle, from which additional improvements can ultimately follow. The improvements may be few, compared to deleterious effects, but only the improvements will be captured into the DNA codons, ensuring the future survival of the improved pathway.<sup>14</sup>



**Figure 3.** Biosynthesis of protoporphyrin-IX from protoporphyrinogen-IX. Note the central tetrapyrrole structure. Protoporphyrin-IX is an important biological precursor to chlorophyll, hemoglobin, and vitamin B-12.

Drs Khersonsky and Tawfik, in 2010, further elucidated the mechanism of this type of enzyme evolution through a hypothesis of enzyme ‘promiscuity’. Similar to Jensen’s discussion, enzymes start out a bit primitive in their orientation to a needed biochemical pathway. As both their molecular makeup and their morphology, or 3-D construction, is less specific and less sensitive in identifying its future substrate, it attaches and releases itself with many look-alikes, gradually conforming to a better fit. This act of promiscuity in the cellular milieu allows it to improve its own functionality toward a more efficient and more selective reaction in any biosynthetic pathway.<sup>14</sup>

The hypothesis of *gene transfer* refined by *promiscuity*, which is essentially a process of trial and error, recording only the successes, is entirely predicated on the idea that enzymes actually have the ability to change, thereby improving their efficiency. They are said to do this through better sensitivity and specificity for the most desirable substrate. This is hypothesized to be accomplished by either change in the enzyme’s molecular composition or in its three-dimensional folding pattern. It is also possible to occur through the acquisition of accessory proteins or using downstream intermediate products to facilitate the enzymatic action.

In both rice and in *Synechocystis*, a freshwater cyanobacterium, there is an accessory protein called GUN4 that is responsible for tilting the reaction of protoporphyrin IX towards Mg-protoporphyrin and facilitating the enzymatic action of Mg-protoporphyrin chelatase.<sup>16</sup> Anoxic bacteria use an accessory protein called Tween 80, instead of GUN4. It is interesting to note that in anoxic bacteria the accessory

protein increases the efficiency of the reaction from 71% to 100%.<sup>17</sup> It is controversial whether GUN4 pushes or pulls protoporphyrin IX into the cage-like assembly of the enzyme Mg-protoporphyrin chelatase, exposing the porphyrin ring for the release of two hydrogen atoms in exchange for a magnesium atom, or facilitates extraction of the end product, thereby allowing for more reactions to occur.<sup>17</sup> What is even more important is the overall fold pattern of an enzyme, influenced by accessory proteins and downstream intermediates, which is also critical to the reaction. In fact, there is strong experimental research that demonstrates enzymatic function is heavily based on the fold pattern, although not independent of the protein sequences that comprise the enzyme.<sup>18</sup> Therefore, if biochemical evolution is a reality, the fold pattern has to evolve as well as the molecular composition.

Drs Gauger and Axe reported on the ability of an enzyme to evolve in a biochemical reaction, initially utilizing a less efficient enzyme associated with tryptophan utilization in *E. coli*. The less efficient starting enzyme had only a slight difference in its three-dimensional fold pattern from the optimal, potentially desired enzyme configuration. To tilt the focus of the enzyme-driven reaction toward evolutionary improved efficiency, a literal bath of the substrate tryptophan was made accessible. Over a billion opportunities were followed to assess for any improvement in enzymatic efficiency by self-rearrangement of its fold pattern. Recruitment possibilities were there as the enzyme was not removed from its intracellular state, essentially giving it an open system from which to draw familiar help towards any evolutionary development. None occurred.<sup>19</sup>

This was extended to the cellular level in an attempt to give an entire organism opportunity to choose which enzymes to evolve for improved efficiency. Again, none occurred despite billions of opportunities.<sup>20</sup>

This lack of ability to change a fold pattern or folding behaviour in an enzyme through evolutionary development is compounded when one considers that many enzymes have more than one active site or working fold pattern. This is clearly a problem for evolutionary models, as Axe's results would imply that any given enzyme is a predetermined biomolecular complex.<sup>21</sup> This is supported by the *sampling problem* when one considers the possibility of putting together a typical 300 amino acid, protein enzyme sequence. Without the help of pre-encoded DNA to RNA for protein manufacturing, a typical protein of 300 sequences would have to be randomly assembled and, through promiscuity, develop an optimal fold pattern. In a recent review article, Axe takes this very concept to its logical conclusion. Protein sequences associated with enzymes are very lengthy, the average reported for *E. coli* being around 300. The possible number of mutations required to develop such a protein sequence, one at a time, is far less than the actual probability of getting the sequence right even once through random assignment, on the order of  $10^{390}$ .<sup>18</sup> For perspective, Axe points out that it has been estimated that  $10^{150}$  is the sum of atomic interactions since the beginning of the universe according to the conventional paradigm.<sup>22</sup> This of course leaves a considerable number of unused combinations as interfering trash to deal with, that have no worth in obtaining a single useful protein. To quote Dr James Tour, Rice University, Professor of Materials Science and Nanoengineering:

"If one asks the molecularly uninformed how nature devises reactions with such high purity, the answer is often, 'Nature selects for that' . . . To select, it must still rid itself of all the material that it did not select. And from where did all the needed starting material come? And how does it know what to select when the utility is not assessed until many steps later? The details are stupefying and the petty comments demonstrate the sophomoric understanding of the untrained."<sup>23</sup>

With so many possible combinations, why does the average cell contain only an infinitesimally few usable proteins, around 20,000 in a functional cell? Further, why only the use of 20 of the possible 60 amino acids in making these extremely complex proteins? Both questions beg a new theory for biochemical evolution. Considerable research will be required to test a multitude of useful proteins to assess their resistance to change to further test this hypothesis.

### **Cellular protection from biochemical pathway intermediates**

For the sake of the evolutionary argument, let's for a moment say that evolution has progressed along the

biochemical pathway toward chlorophyll, following the oxidation of protoporphyrinogen IX. In bringing the pyrrole rings together there now exists protoporphyrin IX, which you might remember as the branch point leading to chlorophyll or to heme production (figure 3).<sup>5</sup> Unfortunately, there is another problem at this juncture. To quote Blankenship: "Excited protoporphyrin IX reacts readily with molecular oxygen to form the highly damaging species singlet oxygen."<sup>5</sup> If unchecked, truly a *great oxidation event* will occur and destroy whatever is around it! The oxidation potential for chlorophyll-b and other intermediates has been explained in detail by Dr Swindell in a previous 2003 article in *Journal of Creation* (figure 3).<sup>24</sup> The great pitfall in the evolution of chlorophyll biosynthesis is the potential of destructive oxidation by the intermediate products along the biosynthetic pathway.<sup>24,25</sup> There are additional complications when considering the secular model of molecular evolution.

A single molecule of oxygen, bound to the 3<sup>rd</sup> ring of chlorophyll-b, can be released in the form of an oxygen singlet. This is an extremely strong oxidizing agent produced by unbound or free chlorophyll-b if there is excess production.<sup>24,25</sup>

"[Free] chlorophyll and most of its intermediate molecules are powerful photosensitizers. When these molecules are accumulated in excess in cells, they generate O<sub>2</sub> and induce growth retardation and/or cell death."<sup>26</sup>

The protective mechanism against overproduction of chlorophyll-b in almost all plant cells is done by controlling the intermediate steps to maintain a proper balance between chlorophyll-a and chlorophyll-b. A Clp protease controls the enzyme, chlorophyllide-a oxygenase, which facilitates the production of chlorophyll-b from chlorophyllide-a. Chlorophyllide-a oxygenase is a large enzyme with three domains, of which the A domain is the catalytic portion. This Clp protease is not as large a protein, but it must still be coded for in cellular DNA.

"Taking into account the complexity of this pathway [the biosynthetic pathway of chlorophyll production], it is reasonable to consider that the biosynthesis of chlorophyll is tightly regulated . . ."<sup>26</sup>

This forces us to assume that many steps in chlorophyll biosynthesis, from glutamine to chlorophyll or to bacteriochlorophyll, are highly regulated. This because many of the intermediates are also photosensitive and could release their oxygen molecules with overaccumulation, prior to combining with an available enzyme at the next step.<sup>24</sup>

Blind evolutionary processes leading up to the production of chlorophyll would have to go through steps parallel to the development through intermediate steps of each enzymatic protein and the development through intermediate steps of each protective protease. This would require the evolution



**Figure 4.** Artist, God.

of each biochemical chain to wait for the other to catch up or risk oxidizing and burning up the entire evolutionary attempt and being required to evolve all over again.<sup>24</sup> This, ostensibly, would literally require millions of repetitions, regressions, and progressions along an already complex biosynthetic pathway just to make chlorophyll, and there would have to be a *sentient pause* after many of the evolutionary events, waiting for one or another of the parallel pathways to catch up to accomplish the overall evolutionary task even once. A *sentient pause* would certainly be an oxymoron to a Darwinist. If you won't allow intelligent design, you certainly cannot allow intelligent pauses.

Once chlorophyll is made, it has to be conjugated with a larger protein molecule for it to be incorporated into Phase II (the light cycle), which is then linked with Phase I (the dark cycle) of the photosynthetic pathway, all of which are even more complex and need greater protection from oxidation. If one were to number the steps in two dimensions only, given the approximately 54 steps required in parallel processes that must occur without a single error and be perfectly coordinated to prevent destructive oxidation, the probability of a single, first successful outcome in an open system, without outside influence, would be  $1/54! = 2.3 \times 10^{-71}$ . In other words, it would take about  $8.4 \times 10^5$  Ga to happen once, correctly, but only if each possible evolutionary step took one nanosecond to occur with either success or failure, and with no failures duplicated. That would make the evolutionist's universe of 3.5 Ga old, too young! Realistically, most would assume an event with a probability less than the inverse of Avogadro's number ( $6.0 \times 10^{-23}$ ) would never happen.

## Conclusions

The wide acceptance of the Great Oxidation Event, the transition of earth's atmosphere into one with oxygen for us to breathe, is mostly blind support of a secular hypothesis, conveniently packaged as fact. Although the bulk of the literature uses the typical 'black box' approach, couching the analysis of the data in Darwinian terms, not all respected evolutionists feel the GOE will stand the test of time.<sup>27</sup> The research by Axe strongly rejects both the ability for an individual enzyme to evolve its fold pattern and for its initial and subsequent presence to be established in a highly specific form out of all of the possible permutations, in the timeframe given by evolutionists. Additionally, the intermediate products of each branch to chlorophyll-a and heme are used in the pathway to direct further production of each. Feedback directional mechanisms, whether for a train in a railyard or for a biochemical pathway are planned out in advance. The same is true for protective mechanisms that parallel other biosynthetic pathways. Without them, development of the intended pathway, if not the entire cellular structure, would be hampered or the pathway even destroyed. Parallel evolution of such systems would require '*sentient pauses*' for evolutionary progression, which is an oxymoron to the evolutionist. Although no-one was there when God created the universe, extremely confident predictions can be made at the biochemical level as to when certain events happened, utilizing the hypothesis of '*irreducible complexity*'. It has already been noted that the oldest known life-forms, Archaea and Cyanobacteria, have always had mature or modern-day biochemical pathways for photosynthesis. Further research by creation scientists should focus on early gene coding for a Clp protease or any portion of the protease system for both cell protection and cell destruction. Searching 'early life' for genetic templates of the enzymatic proteins involved in the biosynthesis of chlorophyll has already been mentioned, but the presence of both systems in the most 'primitive of cells', as suggested by Dr Ping-Yi Li *et. al.* would further support the creation model, by their simultaneous appearance on Earth.<sup>28</sup>

With such strong support for the creationist paradigm, the GOE of evolution should be renamed the Great Phylogenetic Event of creation. To quote Blankenship:

"For a lot of biochemical systems, you'll find that nature has figured how to skin the cat several different ways. Here it seems not to be the case. It seems the ability to oxidize water to molecular oxygen only appeared once during the course of evolution. That is testament to the fact that chemically, it is a very difficult problem and thing to do."<sup>29</sup>

On the third day of creation, oxygenic photosynthesis on land was initiated in both unicellular and multicellular organisms. The creation of water-borne bacteria and thermophilic organisms might not have occurred until the

5<sup>th</sup> day as their epigenetics are different than that of plant life on land. Rhizomes and bacteria in the soil could have been created on either the 3<sup>rd</sup> or 6<sup>th</sup> day, but bacteria preceded the creation of Adam as some were a symbiont to him in his gastrointestinal tract and on his skin surface, immediately colonizing him for his benefit following Jesus breathing into him the breath of life. Anoxic and oxygenic photosynthesis were then a simultaneous creation, not separated by billions of years. All pathways were protected from their intermediates by the simultaneous creation of the necessary proteolytic enzymes. Extension beyond to the bacteriochlorophylls may not have taken place until the 5<sup>th</sup> day and certainly the side branch from protoporphyrin IX to protoheme to hemoglobin, not until the 6<sup>th</sup> day when circulatory systems were created in animals and man. As Bosak said of the GOE, I must say in light of the Great Phytogenic Event of creation, i.e. of the origin of the biochemical pathway to bacteriochlorophyll, chlorophyll and hemoglobin, *that God is the only likely candidate* (figure 4).

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# The spiritual roots of modern feminism

Augusto Zimmermann

Feminism proposes a complete rejection of the Judeo-Christian paradigm for male–female roles, relationships, and social structures, as well as the biblical understanding of God. The ultimate quest of the feminist movement has always been spiritual, and Satanism was anything but a marginal phenomenon in early feminist narrative. To the contrary, Satanism and feminist politics were interwoven from the first appearance of the theme of Satan as a benevolent figure and the liberator of womankind. Leading feminists regularly performed counter-readings of the Bible to conceptualise Lucifer as a feminist liberator of womankind and Eve as a heroine. This article explains how prominent feminists—primarily during the time period 1880–1930—used Satan as a symbol of rejecting ‘patriarchal’ traits of Christianity. It discusses neglected or unknown aspects of the intellectual connections of feminism with Satanism and the centrality of the latter in early feminist narrative and imagination.

The connections of early feminism with secular ideologies such as liberalism, socialism, and postmodernism are well known to the general public. I have, myself, written about them in several of my academic articles, including an entire chapter in my book on Western legal theory.<sup>1</sup> What surprised me, however, was to recently come across a seminal book addressing the spiritual dimensions to early feminism—such influence underpinning the early feminist movement in the nineteenth century. This was entirely unknown to me until I discovered this fundamental book on the subject.

Per Faxneld is a Swedish academic who holds a Ph.D. in History of Religions (obtained in 2014).<sup>2</sup> *Satanic Feminism: Lucifer as the liberator of women in nineteenth-century culture*<sup>3</sup> is based on his doctoral dissertation, which was awarded the Donner Institute Prize for Eminent Research on Religion, and later republished as a book by Oxford University Press, in 2017. In a nutshell, it addresses how prominent early feminists—primarily during the time period 1880–1930—frequently used Satan as a symbol of liberation and rejection of so-called patriarchal traits of Christianity. It emphasises how these women were particularly inspired by the period’s most influential new religion, Theosophy<sup>4</sup>, and how anti-Christian discourses of radical secularism also deeply impacted the early feminist movement.

Based on this impressive academic work, this article aims at examining the spiritual roots of modern feminism. It contends that the ultimate quest of the feminist movement has always been spiritual. Mainstream feminism proposes a complete rejection of the Judeo-Christian paradigm for male–female roles, relationships, and societal structures, as well as its biblical concept of God. As noted by Mary Kassian, a distinguished professor of women’s studies at Southern Baptist Seminary:

“Feminism began with the deconstruction of a Judeo-Christian view of womanhood; progressed to the deconstruction of manhood, general relationships,

family/societal structures, and a Judeo-Christian worldview; and concluded with the concept of metaphysical pluralism, self-deification, and the rejection of the Judeo-Christian deity.”<sup>5</sup>

## Lucifer as a ‘liberator’ of women in the 19<sup>th</sup> century

Satanism and feminist politics were interwoven from the first appearance of the theme of Satan as a benevolent, revolutionary figure and the liberator of womankind. Leading figures of the early feminist movement (including suffragette Elizabeth Cady Stanton, actress Sarah Bernhardt, and poetess Renée Vivien) viewed God as depicted in the Bible as the precursor of patriarchy and Satan as an ally in the fight against it. This feminist view of Satan was “intertwined with prominent anticlerical, left-wing, and esoteric currents of its time”.<sup>6</sup> Examples include employing Lucifer as a symbol of revolution, and eulogizing him as an antipatriarchal figure. In those days, feminists performed counter-readings of the Bible in order to conceptualize Lucifer as a liberator of womankind and an ally in the women’s struggle against the ‘patriarchy’ supported by God the Father and His Son. Accordingly, “Eve’s ingestion of the forbidden fruit becomes a heroic act of rebellion against the tyranny of God and Adam.”<sup>6</sup>

Take, for instance, the contributions of Judith Sargent Murray (1751–1820). This celebrated poet is broadly regarded as the most prominent female essayist of the 18<sup>th</sup> century in the United States. She was also among the country’s earliest champions of financial independence and equal rights for women. In her 1790 essay *On Equality of the Sexes* Murray expressed opposition to certain biblical passages—most notably involving Adam and Eve in the book of Genesis. She attempted to vindicate Eve with a counter-reading of the same passage. Eve’s behaviour in the Garden was motivated, according to her, by “a laudable ambition … and a thirst for knowledge”, whereas Adam,

who ate the forbidden fruit that Eve offered to him, acted out ‘bare pusillanimous attachment to a woman’.<sup>7</sup> In the words of Robert P. Wilson, an English literature academic at Binghamton University:

“The essay concludes with a ‘supplement’ in which Sargent Murray reverses the traditional … reading of the Book of Genesis that held that Eve … caved to temptation and dragged Adam (and thus all of mankind) into sin. Instead Sargent Murray argues that … the devil appeared as a ‘shining angel’ and promised to fulfil her ‘laudable ambition’ for ‘a perfection of knowledge’—Adam followed not because of the devil’s wily deceptions or promises of enlightenment, but merely according to ‘a bare pusillanimous attachment to a woman!’ Sargent Murray thus reverses gender stereotypes by characterizing Eve as inspirational and noble, and Adam as shortsighted and weak.”<sup>8</sup>

Matilda Joslyn Gage (1826–1898) was a leader of the women’s suffrage movement in the United States. A founding member and later president of the National Woman Suffrage Association, she expressed a profound indignation over “the wrongs inflicted upon one-half of humanity by the other half in the name of religion”, and Christianity in particular.<sup>9</sup> Gage convened the first feminist group solely devoted to the promotion of an antireligious secularist state via the strictest possible separation of church and state. In response to those who acknowledged the Christian roots of America’s society and its legal system, Gage stated: “in order to help preserve the very life of the Republic, it is imperative that women should unite upon a platform of opposition to the teaching and aim of that ever most unscrupulous enemy of freedom—the Church”.<sup>9</sup> Gage delivered an address entitled “Woman, Church, and State” at a suffrage convention in 1878. She later turned this famous address into a book of the same name which denounces alleged abuses against women stemming from biblical doctrines, including the witch hunts. Gage declared:

“No rebellion has been of like importance with that of Woman against the tyranny of Church and State; none has had its far reaching effects. We note its beginning; its progress will overthrow every existing form of these institutions.”<sup>9</sup>

The first major systematic attempt at feminist Bible criticism was *The Women’s Bible* (2 vols, 1895–1898), a book edited by American suffragette Elizabeth Cady Stanton (1815–1902; figure 1) and written by her and her revising committee of feminist writers from England, Finland, Scotland, Austria, and France. Stanton was the leading figure of the early feminist movement and her negative view of Christianity was not unique in those early feminist circles. She had, for years, been denouncing the alleged role played by Christianity in the subordination of women in all spheres of life. The first volume of *The Woman’s Bible* covered the Pentateuch and it immediately became a bestseller, going

through seven printings in six months. A second volume of the book appeared in 1898, covering the books from Joshua, in the Old Testament, to Revelation, at the end of the New Testament. In her introduction to *The Woman’s Bible*, Stanton both contends that the church constitutes “the very powers that make woman’s emancipation impossible” and explains to female readers that “your political and social degradation are but an outgrowth of your status in the Bible”.<sup>10</sup> Also in Stanton’s chapter to *The Women’s Bible*:

“She brings up the teaching that Eve caused the Fall of Man, and how this has been used to subjugate women ever since. In the detailed commentary on Genesis 3, she rejects the general idea of the Fall and states her view that the Darwinian theory of the gradual growth of the race from a lower to a higher type of animal life, is more hopeful and encouraging.”<sup>10</sup>

Elizabeth Cady Stanton and her colleagues particularly felt they had to address the ‘patriarchal’ narrative in the book of Genesis, chapter 3. One way of doing so was to turn the narrative on its head, to turn Eve into a heroine and the serpent benevolent. Eve is eulogized in her consumption of the forbidden fruit in the Garden of Eden, and depicted in collusion with Satan as a liberator of women.<sup>11</sup> With a benevolent Satan, Eve’s actions in the Garden become laudable, and women are deemed superior to men ‘for being the first to heed Satan’s advice’.<sup>12</sup> In a letter to the editor of *The Critic*, she positively likens Satan to the woman’s thirst for knowledge.<sup>13</sup> She describes the primary implication of deconstructing Genesis chapter 3, as follows:

“Take the snake, the fruit tree and the woman from the tableau, and we have no fall, nor frowning judge, no Inferno, no everlasting punishment—hence no need of a Savior.”<sup>14</sup>



**Figure 1.** Elizabeth Cady Stanton (1815–1902) was an American suffragist and leading figure of the early feminist movement. She edited *The Women’s Bible* (2 vols, 1895–1898), a book that inverts the biblical account of Genesis by making Eve a heroine and the serpent benevolent. With a ‘benevolent Satan’, Eve’s actions in the Garden become laudable, and women are superior to men for being the first to heed Satan’s advice.

Across Europe, there were many examples of Genesis 3 being repeatedly treated in highly critical fashion. Helena Blavatsky (1831–1891; figure 2), to give just one example, was notorious for promoting Satanic inversions of Genesis 3 in order to argue that “Satan, the enemy of God, is in reality, the highest divine Spirit”.<sup>15</sup> Her books *Isis Unveiled* (1877) and *The Secret Doctrine* (1888) were “hugely commercially successful”, with the first selling half a million copies up until 1980.<sup>16</sup> Throughout *The Secret Doctrine*, for instance, Blavatsky praises Lucifer and hails him as ‘Saviour’ of humankind. In vol. 1, *Cosmogenesis*, she wrote:

“The devil is now called Darkness by the Church, whereas, in the Bible he is called the ‘Son of God’ (see Job), and ‘the bright star of early morning’ (see Isaiah) . . . He was transformed by the Church into . . . Satan, because he is higher and older than Jehovah, and had to be sacrificed to the new dogma.”<sup>17</sup>

In vol. II, *Anthropogenesis*, she continues to exalt Lucifer and to raise him up as “the highest divine Spirit”. “To make the point clear once for all”, she stated, “that which the clergy of every dogmatic religion—pre-eminently the Christian—points out as Satan, the enemy of God, is in reality the highest divine Spirit”.<sup>18</sup>

A prominent component of Blavatsky’s writings was the emancipation of women, which in this respect involved a frontal attack on the ‘male’ God of the Bible. In her books, the biblical account of the Fall is depicted as a positive event that implies an up-valuation of women: “She is no longer responsible for mankind’s fall into sin but is instead actively involved in the gaining of spiritual wisdom from the benevolent snake”.<sup>19</sup> Her sympathy for the Devil is particularly evinced in the publication of a feminist journal she published in England called *Lucifer*. This journal spread the notion of a possible connection between Satan and the struggle for women’s rights across the Western nations. Through its choice of name, in combination with a heavy emphasis on women’s rights, this publication disseminated the image of Satan and female emancipation as somehow closely related.<sup>20</sup> According to Lee Penn, an American journalist who holds a BA cum laude from Harvard:

“[Blavatsky] urged people to return to the mother-goddess of Hinduism and to the practice of feminism virtues. This continued under the guidance of Annie Besant, who was in the vanguard of the feminist movement. Wicca and ‘women’s spirituality’ carry on this struggle against ‘patriarchal’ Christianity today.”<sup>21</sup>

The actress Sarah Bernhardt (1844–1923; figure 3) starred in some of the most popular French plays of the late 19<sup>th</sup> and early 20<sup>th</sup> centuries. This included *La Dame Aux Camélias*, by Alexandre Dumas, and *Ruy Blas*, by Victor Hugo. One influential French journalist stated that Bernhardt “had the gift of being worshipped by officialdom, high society, people of the lower classes, as well as by elitist coteries of writers and artists”.<sup>22</sup> As noted by Faxneld, “she did frequently play

with a symbolism closely connected to Satanism, and, for example, sculpted a figurine that can be seen as a portrait of herself as the Devil”.<sup>23</sup> Parisian lesbians used her as a role model when forging subversive sexual identities because “much of her behaviour was clearly disruptive of gender roles: wearing men’s clothes on and off the stage”.<sup>24</sup>

Take also the example of Sylvia Townsend Warner (1893–1978), the celebrated writer of novels, short stories, and poems. She contributed short stories to the *New Yorker* for more than 40 years. Educated by an atheist father of learning, she was acquainted with the Bible from an early age.<sup>25</sup> Her debut novel, *Lolly Willowes* (1926), tells the tale of Laura ‘Lolly’ Willowes, who becomes a witch liberated and empowered by Satan. The story is actually quite simple. David Carroll, an associate professor of English at the University of Maryland, explains it as follows:

“Lolly tires of her family, leaves London for the countryside and makes a surprisingly casual arrangement with Satan to enter his service as a witch. Lolly’s adventure is not really an adventure: it is as free of dramatic reversal or complications as it is of rhetorical flourish. Warner’s conclusion presents the reader with the disarming notion that Lolly’s submission to Satan is a form of freedom.”<sup>26</sup>

Warner’s first novel, according to Dr Faxneld, “is quite possibly the most explicit and conspicuous literary example ever of programmatic Satanic feminism”.<sup>27</sup> In spite of that, *Lolly Willowes* caused a major stir and it received highly favourable reviews. The book draws on contemporary understandings of witch cults and there were aspects of the text that directly relate to “demonic lesbianism, a view of Christianity as a central pillar of patriarchy, and nature being coded as Satan’s feminide realm where he can offer immunity from the pressures of a male-dominated society”.<sup>28</sup> Thus Faxneld’s observation that:

“Warner is a contributor to a pre-existing discourse where witchcraft and Satanism are used to portray female emancipation. While her novel is extraordinarily explicit and articulate when it comes to making Satan a liberator of women . . . Warner’s text could be considered a reply to the literal demonization of feminists . . . , inverting it and claiming Satan and witches as positive symbols of feminist resistance.”<sup>29</sup>

Informed by this legacy, some modern feminists seek to reclaim the ‘satanic revolutionary’ as a political and cultural force to empower women and create radical change. Echoing this anti-Christian sentiment, feminist activists increasingly identify the witch as a protector and benevolent figure. “The idea of the witch has always been about subversive feminist power that does align with conventional norms”,<sup>30</sup> writes Jex Blackmore, a feminist writer and political activist. She expresses her profound admiration for Satan as “a magnificent and powerful angel who rebelled against the tyranny of God”.<sup>31</sup> Blackmore’s feminist advocacy has included dumping gallons



**Figure 2.** Helena Blavatsky (1831–1891) was an early proponent of the Victorian religious movement known as modern Spiritualism. In 1875, she co-founded the Theosophical Society, an organisation that was concerned with ascertaining the ‘occult mysteries’ of the world. Blavatsky came from a long line of feminist thinkers. Her maternal grandmother, Helena Pavlovna Dolgorukov (1789–1860), was an early example of feminist thinker. In her widely read books, Blavatsky argued that “Satan, the enemy of God, is in reality, the highest divine Spirit”<sup>15</sup> who, according to her, “brought mankind spiritual wisdom”<sup>16</sup> and “the spirit of Intellectual Enlightenment and Freedom of Thought”.<sup>18</sup>

of milk outside pro-life demonstrations, and writing about her own abortion experience in the blog *Unmother*. She sees in Satanism an important liberating force in the ongoing feminist fight for reproductive rights. “Bodily autonomy is central to Satanic philosophy”, she argues. Indeed, recently *The Satanic Temple* filed a lawsuit against Missouri because of its enactment of a law requiring any woman seeking an abortion to wait 72 hours.<sup>31</sup>

Kristen J. Sollée is a lecturer in gender studies and founding editor of *Slutist*, a feminist arts and culture award-winning website. She has written for mainstream and academic publications; organized numerous music events and art exhibitions; and lectured at colleges and conferences in the U.S. and Europe. In these undergraduate lectures, Sollée traces the history of ‘witch feminism’ from early modern Europe to the present, delving particularly into the links between witches and women’s reproductive rights, as well as the role of the witch in feminist activism over the past century. Her first book, *Witches, Sluts, Feminists: Conjuring the Sex Positive* (2017),<sup>32</sup> was described in *The Guardian* newspaper as “a whirlwind history of the witch in America and her shared history with sexually liberated women and radical liberation politics”.<sup>33</sup> Her famous *Legacy of the Witch* festival in Brooklyn (NY) “honors the witch as an icon of female power and persecution through

music, art and burlesque”.<sup>32</sup> According to Sollée, it certainly should come as no surprise that many feminists are deeply drawn to Satanism:

“Occult practices—Satanism included—can be avenues to individual and collective empowerment that many feminists are seeking . . . They are often viable alternatives to the patriarchal systems that seek to repress and police female and queer sexualities, bodies, and identities, because they provide access to activist-minded communities with life-changing potential.”<sup>31</sup>

### Feminism's hostility to biblical Christianity

Feminist scholars often claim that Christianity has been a major source of oppression of women throughout history. Amid ongoing denunciations that the Christian religion is inherently patriarchal and sexist, feminist scholars often ignore that the early church was particularly attractive to women. The first Christian communities were predominately female, not male.<sup>34</sup> As noted by Cambridge historian Henry Chadwick (1920–2008), in ancient Rome, “Christianity seems to have been especially successful among women. It was often through the wives that it penetrated the upper classes of society in the first instance.”<sup>35</sup>

Rodney Stark is Distinguished Professor of the Social Sciences and co-director of the Institute for Studies of Religion at Baylor University. According to him, “objective evidence leaves no doubt that early Christian women did enjoy far greater equality with men than did their pagan and Jewish counterparts”.<sup>36</sup> Stark comments that “there is virtual consensus among historians of the early church as well as biblical scholars that women held positions of honor and authority within early Christianity”.<sup>37</sup>

This works in line with the Apostle Paul’s commendation of “our sister Phoebe” to the Roman congregation, stating that she was a “deaconess of the church of Cenchrea” (Romans 16:1–2). In 1 Timothy 3:11, Paul refers to women in the role of deacons, and in Corinthians 11:11–12 he talks about the right of women to prophesy, and that they are as essential as men in Christian fellowship: “For it is through women that man comes to be, and God is the source of all.”

In deeply elevating the status of women, the early Christians were simply emulating the example of Jesus Christ, who had numerous women as friends, followers, and supporters. Christ even saved a woman caught in adultery from being stoned to death (see John 8:1–11). As noted by U.S. theologian Gary Thomas: “Jesus challenged and confronted these attitudes about women, lifting women up and including them in his inner circle of confidants and supporters” (see Luke 8:1–3).

The Bible declares that “there is neither Jew nor Greek, slave nor free, male nor female, for we are all one in Christ Jesus” (Galatians 3:28). Arguably, in an ideal Christian

community all barriers of prejudice must be broken, including xenophobic nationalism (Greek or Jew), racism (barbarian or civilized), social discrimination (slave or free), and finally, of course, gender discrimination (male or female).

Some feminist critics have dismissed these biblical statements. They assume that such statements had no impact on the advancement of human rights, in particular the rights of women. However, according to Sanford Lakoff, emeritus professor of political theory at the University of California, San Diego:

“The Christian teaching with the greatest implications for democracy is the belief that because humanity is created in the image of God, all human beings are of equal worth in the sight of God. ... As Alexis de Tocqueville noted when he observed in the introduction to his study of democracy in America ... Christianity, which has declared all men equal in the sight of God, cannot hesitate to acknowledge all citizens equal before the law.”<sup>38</sup>

Frequently, feminist scholars remain ignorant, or unwilling to recognize, what the Apostle Paul wrote concerning marriage and sex:

“The husband should give to his wife her conjugal rights, and likewise the wife to the husband. For ... the husband does not rule over his own body, but the wife does. Do not refuse one another except perhaps by agreement for a season, that you may devote yourselves to prayer; but come together again, lest Satan tempt you through lack of self-control” (1 Corinthians 7:3–5).

This means that Christian husbands should not hold back from their role of fulfilling their wives’ sexual needs. Naturally, even this fact may not pacify those who are stubbornly convinced that Christianity must be an antiwoman religion. This is particularly so when a person does not understand the meaning of the instruction found in Paul’s letter to the Ephesians:

“Wives, submit yourselves to your own husbands as you do to the Lord. For the husband is the head of the wife as Christ is the head of the church, his body, of which he is the Saviour. Now as the church submits to Christ, so also wives should submit to their husbands in everything” (Ephesians 5:22–24).

Submitting to another person is an often misunderstood concept. For the Christian wife, this means obeying a husband who is acting in a godly, Christlike manner. For the Christian husband, this means putting aside his selfish desires so that he can care for his wife’s well-being. This is why Paul adds this important admonition: “Husbands, love your wives, just as Christ also loved the church and gave himself for her” (Ephesians 5:25). Paul is here stating that husbands must sacrifice everything for their wives. They must give away even their lives if necessary. A Christian husband is obliged to make his wife’s well-being his ultimate priority, “so husbands

ought to love their own wives as their own bodies; he who loves his wife loves himself” (Ephesians 5:28).

The essence of Christian leadership is sacrificial love. This essence of sacrificial love can be found in Philippians 2, where Paul urges believers to “do nothing out of selfish ambition or vain conceit, but in humility consider others better than yourselves. Each of you should look not only to your own interests, but also to the interests of others” (Philippians 2:3–4). Paul then goes on to increase this self-sacrificial role of leadership by requesting believers to emulate the example of Christ himself, “who, being in the very nature God ... made himself nothing, taking the very nature of a servant” (Philippians 2: 6–7). That Christ often expressed this principle is found in these passages of Scripture:

“But Jesus called them to Himself and said, ‘You know that the rulers of the Gentiles lord it over them, and those who are great exercise authority over them. Yet it shall not be so among you; but whoever desires to become great among you, let him be your servant. And whoever desires to be first among you, let him be your slave—just as the Son of Man did not come to be served, but to serve, and to give His life a ransom for many’” (Matthew 20:26–27).

“The greatest among you will be your servant” (Matthew 23:11).

“Sitting down, Jesus called the Twelve and said, ‘Anyone who wants to be first must be the very last, and the servant of all’” (Mark 9:35).

“Not so with you. Instead, whoever wants to become great among you must be your servant” (Mark 10:43).

“But not so among you; on the contrary, he who is greatest among you, let him be as the younger, and he who governs as he who serves” (Luke 22:26).

According to Timothy Keller:

“Jesus redefined all authority as servant-authority. Any exercise of power can only be done in service of the Other, not to please oneself. Jesus is the one who did not come to be served, as the world’s authority figures expect to be, but to serve, to the point of giving his life.”<sup>39</sup>

In the language of biblical Christianity, a leader is the one who is the most self-effacing, the most sacrificial, and the most devoted to the good of others. It takes an equal degree of submission for a faithful husband to submit himself to such a sacrificial role, as a ‘servant-leader’ in the marital relationship.

In contrast, the ultimate feminist goal is personal empowerment at the expense of all other interpersonal achievements. The expectations of husbands, parents, and children become less important than a woman’s ‘right’ to full autonomy and self-determination. What could be more departed from the Christian ideas of ‘love of the neighbour’ and self-sacrifice? It is therefore no wonder that Christianity is so hated by such feminists.



**Figure 3.** Sarah Bernhardt (1844–1923) was an actress who starred in some of the most popular French plays of the late 19<sup>th</sup> and early 20<sup>th</sup> centuries, including *La Dame Aux Camelias*, by Alexandre Dumas, and *Ruy Blas*, by Victor Hugo. She often played with Satanic symbolism and even sculpted a figurine that is seen as a portrait of herself as the Devil. Parisian lesbians used her as a role model when forging subversive sexual identities.

### The ultimate subversion: ‘evangelical feminism’

The thesis that the biblical account is construed by men in order to perpetuate their hegemonic power over women is one of the hallmarks of postmodern feminism. Such postmodern interpretation of Scripture claims that the roles assigned to women are not natural, but socially constructed. Male and female roles and behaviour are said to be not influenced by natural or biological differences, but are socially conditioned and construed in order to sustain social relations of power and domination. Inspired by the postmodernist rejection of biblical Christianity, feminists take aim at traditional biblical concepts of family, marriage, and sexuality, debunking them as no more than expressions of Western white male power.<sup>40</sup> According to these feminists, knowledge on these issues “is never more than beliefs constructed by men to justify existing power relationships, and there is no such thing as objective truth on which to base social structures such as marriage and family”<sup>41</sup>

Feminist propositions based on postmodern philosophy stand in direct antithesis to biblical doctrine. They have moved as far away from the God of Bible as possible.<sup>42</sup> However, in the 1960s Christian feminists set themselves on a course parallel to that pursued by other feminists in ‘secular society’. The major thesis proposed by Christian feminists in the early 1960s was identical to the thesis exposed in postmodern feminism: that there were no demonstrable differences between male and female. They believed that

women should be allowed to do everything a man can do, and in the same manner and with the same recognized societal status. Christian feminists view freedom as a process that rests within the individual. It is realized through personal experience. Thus, theologian Valerie Saving Goldstein argued that the greatest sin of women was too much sacrificial love and not enough pride in themselves.<sup>43</sup>

Evangelical feminism is on the rise. These Christian feminists do not comprise a new group, but a revived group that is constantly reinventing itself for the next generation. Feminism in the late 19<sup>th</sup> and early 20<sup>th</sup> centuries included an interest in the place of women in religion. During the 1960s and the 1970s evangelical feminists began writing articles that addressed reproductive rights as well as inequality in marriage and in the religious hierarchy. In response to these articles, groups such as the “Evangelical Women’s Caucus” and the “Evangelicals for Societal Action” were formed in order to create a social movement in the church towards a ‘Christian feminist ideal’ of absolute gender equality and the denial of anything uniquely masculine in the natural order.

Christian feminists argue that women’s role is based on culturally variable factors. They seek androgyny by pursuing women’s ordination and the obliteration of structured roles in marriage. “With an androgynous definition of equality in hand”, writes Kassian, “early feminist theologians were able to argue that they had the right to define their own roles”.<sup>44</sup> Christian feminists then dispute the concept of immutable traits of men and women, and personally attribute any alleged differences between the sexes to the effects of education and cultural environment. One such Christian feminist, Dennis Ashborrok, in an article in *Pastoral Psychology*, commented: “there has been no single exclusive patterning of masculine and feminine roles in history. Cultural relativity is quite prevalent in this regard.”<sup>45</sup> As a result, Kassian points out:

“Feminist theology and philosophy obscured, for many people, what it meant to be male or female. Many believers did not understand that masculine and feminist aspects of character coexist within the individual psyche of all humans and also coexist in the character of God. Men and women who adopted feminist precepts lost touch with the feminist interrelationships between themselves and God and correspondingly shunned masculine/feminine distinction in relationships between humans. They lost perspective of who God is and also perspective of who they—as male and female—are. An improper view of God led to an improper self-identity.”<sup>46</sup>

Many prominent evangelical feminists advocate positions that deny or undermine the authority of Scripture. Feminist theologians take the liberty to discard passages of the Bible that do not agree with their vision of sexual equality. The hermeneutic espoused allows Galatians 3:28 to be included in authoritative canon, but it leaves out 1 Corinthians 11. It totally rejects the authority of Ephesians 5:22 and it scoffs

at 1 Timothy 2:11. They either dismiss these biblical texts as outdated—relative only to a particular time and culture—and the author of the text as misogynistic, or they reinterpret them and assign them a meaning different from what the author had intended.<sup>47</sup> In sum, they embrace only portions of Scripture that more directly appeal to themselves and align with their feminist vision for ‘women’s liberation’.

These feminist scholars often deny the authority or truthfulness of Genesis 1–3 by stating that these words of the Bible have a ‘patriarchal meaning’ that God did not intend, and that some events in Genesis 1–3 are not historically accurate.<sup>48</sup> These positions are normally followed by the endorsement of the moral legitimacy of homosexuality.<sup>49</sup> The common denominator in all this is a persistent undermining of the authority of Scripture, in particular the denial of the biblical account in the first three chapters of the book of Genesis, as well as of all biblical teachings on manhood and womanhood. The late Francis Schaeffer, one of the most celebrated Christian thinkers of the twentieth century, in his book *The Great Evangelical Disaster*, included a section called ‘The Feminist Subversion’, in which he wrote:

“The key to understanding extreme feminism centers around the idea of total equality … the world spirit in our day would have us aspire to autonomous absolute freedom in the area of male and female relationships—to throw off all form and boundaries in these relationships and especially those boundaries taught in the Scriptures … . It is a direct and deliberate bending of the Bible to conform to the world spirit of our age at the point where the modern spirit conflicts with what the Bible teaches.”<sup>50</sup>

He is not the only one who has reached this conclusion. Wayne Grudem, a prominent evangelical theologian, contends that evangelical feminism effectively undermines the authority of Scripture. These evangelical feminists, writes Grudem, aspire to blur and then ultimately deny God’s identity as our Father. According to him, “once evangelical feminism gains control of a church or denomination, the teachings tend increasingly toward a denial of anything that is uniquely masculine”.<sup>51</sup> As Grudem also explains:

“The evangelical feminist agenda will not stop simply with the rejection of male headship in marriage and the establishment of women as pastors and elders in churches. There is something much deeper at stake. At the foundation of [evangelical feminism] is a dislike and a rejection of anything uniquely masculine. It is a dislike of manhood itself.”<sup>52</sup>

Evangelical feminists are now heading toward the denial of anything uniquely masculine. They insist that God should no longer be addressed as ‘Father’, ‘Ruler’, ‘Judge’, ‘Master’, or ‘King’. According to Krister Stendal, dean of Harvard Divinity School, the maleness of God was a “cultural and linguistic accident … . The time has come to liberate our thoughts of God from such sexism.”<sup>53</sup> However, as Kassian points out, “disregarding these names for God reduces and

castrates His character, for the words are not merely figurative, but reflect true aspects of God’s character”.<sup>54</sup> “Therefore, in changing these symbols, feminists attack the very essence of God’s character”.<sup>55</sup>

Another related trend is the removal of masculine language from familiar hymns. The male-oriented words ‘King’, ‘Him’, and ‘He’ are removed. The new hymnal also eliminates references to God as ‘Father’ and ‘Son’. Christian feminists argue that these words bear patriarchal, male-dominant overtones. Some of these evangelical feminists openly advocate praying to God as ‘our Mother in heaven’.<sup>56</sup> The problem with such a theological approach is summarized by Grudem as follows:

“[I]f we call God ‘Mother’ then we are implying that he is a female person. That is contrary to the Bible’s descriptions of him as Father and King and Lord and ‘he’. The Bible gives no justification for calling God ‘Mother’, and in fact it is contrary to the consistent description of God as ‘Our Father in heaven’ (Matt. 6:9) … . Calling God ‘Mother’ is changing God’s own description of himself in the Bible. It is calling God by a name that he has not taken for himself. Therefore, it is changing the way the Bible teaches us to think of God. It is thus changing our doctrine of God.”<sup>57</sup>

## Final considerations

Satanism was anything but a marginal phenomenon in early feminist narrative. Early feminists regularly performed counter-readings of the Bible in order to conceptualize Lucifer as a liberator of womankind and Eve as a heroine. Relying on the same tradition, modern feminists have singled out Christianity as a key institution supporting the subjugation of women. In such a view, the Christian ideal of wifely marital duties is seen as incompatible with a woman’s right to govern herself.<sup>58</sup> Under this assumption, feminists may view Satan as a positive figure and Christianity as an obstacle that has to be removed for women to be fully emancipated.

Under these feminist narratives, Eve’s ingestion of the forbidden fruit becomes a heroic act of rebellion against the tyranny of God and Adam.<sup>59</sup> Satan is praised as an ally in the women’s struggle against the ‘patriarchy’ established by ‘God the Father’ and his male priests. The misinterpretations of crucial biblical passages, in particular the third chapter of Genesis, are responsible for the feminist claim that events in Genesis 1–3 are not historically accurate.<sup>60</sup> These positions are often accompanied by the endorsement of homosexuality and other anti-biblical practices such as abortion, which are positively condemned in Scripture.<sup>61</sup> The common denominator is a persistent undermining of the authority of Scripture, in particular the denial of the historical record in the book of Genesis and other biblical teachings on manhood and womanhood.

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# Rapid growth of caves and speleothems: part 1—the excavation of the cave

Michael J. Oard

Caves and their decorations, speleothems, are commonly thought to have formed slowly over millions of years. However, secular scientists struggle to explain how caves could have been excavated by the weak carbonic acid formed in surface soil. Moreover, speleothems are dated too young to fit within their paradigm, and drip locations cannot remain in one place long enough to build any huge speleothems. However, recent research suggests that caves can be excavated rapidly by sulfuric acid dissolution. This is consistent with caves being carved from the widespread occurrence of sulfuric acid from plant and animal decay, and by continental uplift during the Recessive Stage of the Flood.

**C**aves are beautiful but eerie. They display almost an infinite variety of forms, called speleothems, including stalactites (figure 1) and stalagmites (figure 2). Sometimes stalactites and stalagmites join to form a column (figure 3), which can be massive and display fanciful shapes. Speleothems also include flowstones, sheets of carbonate deposits formed along the walls or floors of caves (figure 4).

In three consecutive papers we will examine differing aspects of caves. First, we will show how the Genesis Flood provides a better framework for explaining how caves were first excavated (part 1). Then we will delve into the growth rate variables of caves and speleothems (part 2).<sup>1</sup> Finally (part 3),<sup>2</sup> we will show that indeed speleothems can form rapidly under the unique conditions that prevailed during the Ice Age.

## Caves believed to take millions of years to form

Uniformitarian scientists point to numerous geological processes that are assumed to change so slowly that it would take tens of thousands to millions of years of geological time to create geological features. Caves are one such geological feature. If we assume the present is the key to the past, caves appear to require hundreds of thousands to millions of years to form because most speleothems grow very slowly today. For instance, cave experts Carol Hill and Paolo Forti often hear cavers and cave visitors alike declare: “A large stalactite or stalagmite takes millions of years to form.”<sup>3</sup> Moreover, anti-creationist geologist Arthur Strahler challenged creation scientists on the origin of caves:

“If it can be shown that either the excavation of caverns or their subsequent filling must require a vastly longer time to accomplish than the post-Flood limit, literal acceptance of the Genesis chronology is untenable. We turn first to rates of removal of limestone

by the process of carbonic-acid reaction.”<sup>4</sup>

This quote illustrates that Strahler believes that carbonic acid dissolves carbonate to form the cave opening. However, this is an outdated idea that is based on strict uniformitarianism, since carbonic acid is the only acid that forms in significant quantities in groundwater today. Carbonic acid must therefore seep down from the soil through carbonate and other rocks to reach the area where the acidic water is said to dissolve them.

Surprisingly, modern textbooks still teach that caves form by carbonic acid dissolution<sup>5</sup> despite the research by Hill and Forti that these beliefs are untrue, and that caves take “more likely, only tens to hundreds of thousands of years”.<sup>6</sup>

## Contrary uniformitarian aspects of caves

Caves have simply been assumed to have formed by carbonic acid dissolution because that is what is observed today. However, some scientists admit that no mechanism for cave excavation by carbonic acid is known: “Ground water forms caves, but exactly how is not known.”<sup>7</sup> In fact, a close examination into the details of cave formation reveals that several aspects of caves actually contradict a uniformitarian explanation.

### Problem of how caves excavated by carbonic acid

Carbonic acid is commonly formed in the soil and as it seeps through cracks in the carbonate, it quickly reacts with the carbonate, dissolving it and *neutralizing* the acid. Thus, the percolating water loses most of its ability to dissolve increasing amounts of carbonate that it encounters. This occurs within about 10 m of the surface.<sup>8</sup> Some say within one metre.<sup>9</sup> If so, though, how could percolating carbonic acid continue to seep downward, sometimes over 1,000 m, and remain acidic enough to dissolve even wide cave passageways? This conundrum is why researchers

believe cave development is confined to shallow depths: ‘The classic model for karst development (speleogenesis) is carbonic acid dissolution of carbonate rocks, usually at shallow depths rarely below the water table.’<sup>10</sup>

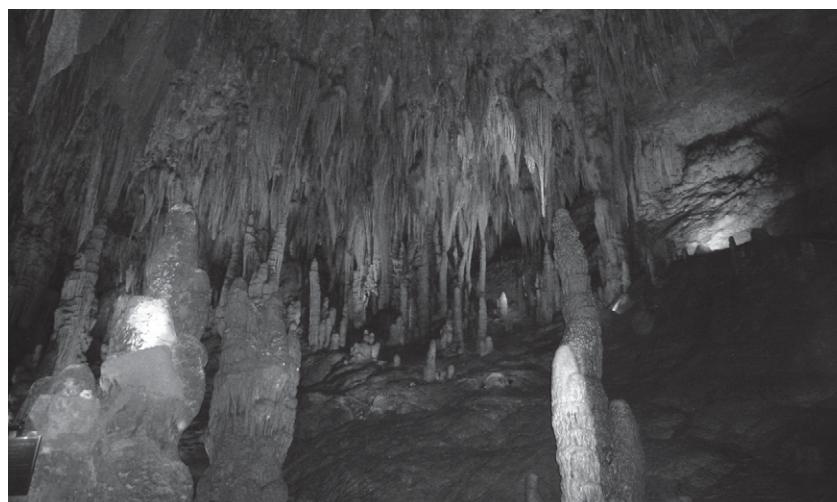
Karst<sup>11</sup> is mainly rough limestone country with underground drainage (figure 5). However, many caves in karst landscapes were formed quite deep—well away from the carbonic acid near the surface, especially considering the large amount of Cenozoic surface erosion (see below for the caves in the Guadalupe Mountains, New Mexico, USA). Uniformitarian scientists say that since such caves exist, the acidic water must have penetrated quite deep. As a result, several *ad hoc* mechanisms have been devised in an attempt to account for this paradox in their speleogenesis models.<sup>9</sup> For instance, some have proposed that when two calcium-saturated solutions mix, the mixture can become unsaturated and dissolve more of the wall of a crack.<sup>12</sup> However, Dreybrodt subsequently admitted that such mixtures become quickly saturated.<sup>13</sup> Such a mechanism does not seem too significant. Deep time is commonly added with the implications that cracks will widen given enough time. However, the time for cracks to widen so that turbulent flow can be initiated may be too long to solve the paradox. Caves require faults and joints, but these are known to fill with minerals and become impermeable to water.<sup>14</sup> Moreover, uniformitarian ‘thinking’ needs a deep valley to make the groundwater move toward the potential cave. Without the deep valley, the water does not move at all or moves too slowly to be effective.<sup>15</sup>

#### Speleothems too young

Show caves, those which the public is allowed to access, commonly display stalagmite growth rates of 0.1 to 3 mm/yr,<sup>8</sup> which are typical for the present day. At this slow current rate



**Figure 1.** Stalactites from Luray Caverns, Virginia, USA, with their reflection in a pool



**Figure 2.** Stalagmites in foreground with stalactites and columns in the background from Luray Caverns, Virginia, USA



**Figure 3.** Wide column from Luray Caverns, Virginia, USA

a 2-m-high stalagmite would take 700 to 20,000 years to form. These rates are still much faster than the results of radiometric dating commonly indicate, which is why Hill and Forti now believe extremely few speleothems are millions of years old, but are instead tens to hundreds of thousands of years old.<sup>6</sup> Under the conditions described in Scripture, a global Flood and the following Ice Age would have caused speleothems to grow much faster than the ages derived from the dating methods. Cave geologist, Dr Emil Silvestru, drives home the conclusion:

“Now, let’s consider one of the tallest stalagmites in the world, in the cave Armand (France)—shown above. At 3 mm per year it would have reached its present 38 m in 12,700 years. Clearly, this contradicts the ages of hundreds of thousands of years obtained from radiometric dating! But, on the surface, it would appear to be too old for the Flood.

... However, as I looked closely at this stalagmite, I realized that its growth must have been even faster in the past, because the water falls over 90 m (300 ft) from the roof to the tip of the stalagmite. This drop, plus the powerful splash at the end, would make it lose CO<sub>2</sub> faster. Furthermore, the climate in the area used to be much wetter about a millennium ago, which would have accelerated growth even more. ... Returning to our generic example: if a 2 m stalagmite were 200,000 years old, its annual growth rate must have averaged 0.01 mm per

year. This is ten times slower than the slowest measured today! Long-agers try to explain this by saying that the growth occasionally stopped completely, perhaps for 10,000 years at a time. And after 10,000 years, they assume that nothing changed—the water drops start arriving again at exactly the same point, with millimetre precision, to fall on the tip of the stalagmite!”<sup>16</sup>

The explanation of a starting and stopping of the drip rate Silvestru notes is very likely a *rescuing device with little to no evidence*. So, secular scientists have a time problem: their dating methods make the speleothems much too old for today’s growth rates.

Other uniformitarian scientists have also come to realize that caves are not that old. Some claim they are less than 5 Ma old, formed in Pliocene to Pleistocene time.<sup>17</sup> Carlsbad Cavern (figure 6) is considered to be about 4 Ma old,<sup>18</sup>



Figure 4. Flowstone (left) from Luray Caverns, Virginia, USA

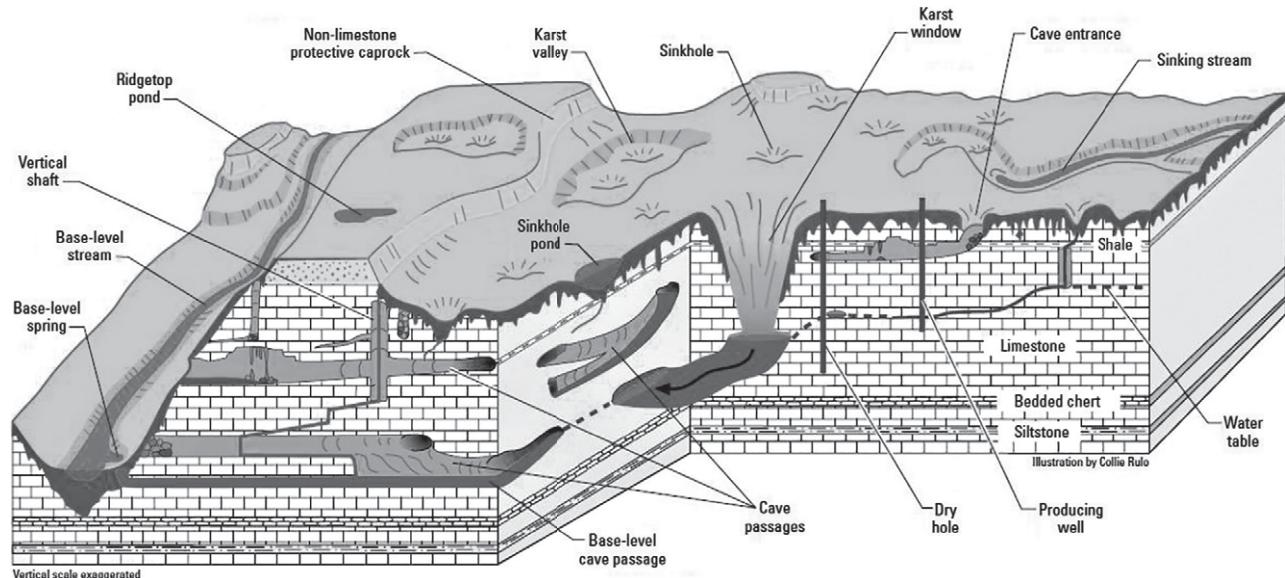
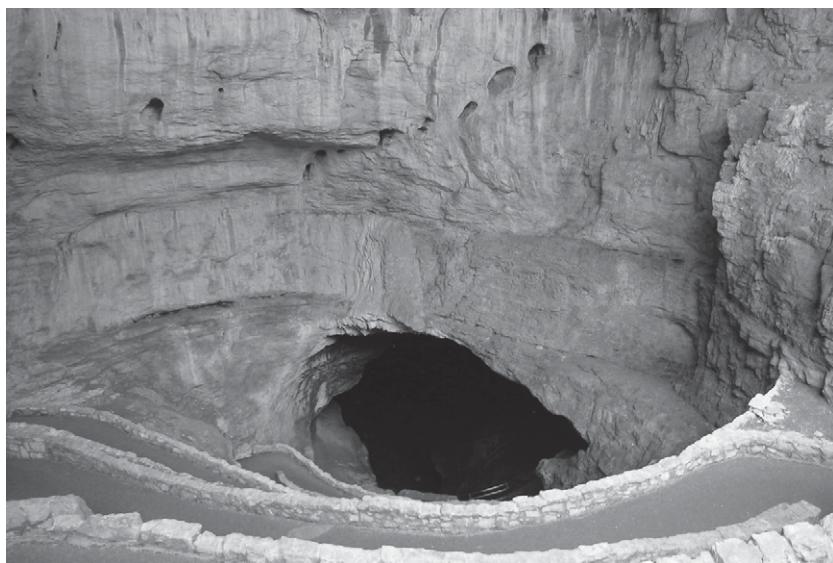


Figure 5. Physiographic and hydrologic features typical of a well-developed karst terrane (USGS)



**Figure 6.** Entrance to Carlsbad Cavern, New Mexico, USA

although the limestone itself is said to be about 250 Ma old. Why not consider the possibility that the caves formed before the Pliocene? After all, the landscape is usually believed to have been around much longer than the Pliocene.

Researchers use uranium series dating for most speleothems, especially if they are confident they are beyond the range of carbon-14 dating (c. 50,000 years). A few other dating methods are also applied, especially beyond 500,000 years, the maximum range for the uranium series method. Regardless, very few claim any speleothem is older than 500,000 years. Secular scientists claim that we need to take into consideration speleothem ‘erosion’. In other words, speleothems break off and stop growth, possibly by a cave flood that shears off their base. They use this to explain why they give such a young age.

#### Drip locations do not remain stationary for long periods

There is a problem inherent with stalactites as young as hundreds of thousands of years old. Their age would imply that the water path through the vegetation and soil above the cave, down through the soil, and through the carbonate<sup>1,19</sup> did not change in all that time. But the soil and vegetation above a cave changes on a regular basis. Moreover, the water path above the caves constantly changes, with variable drip rates at all sites.<sup>20</sup> It is rare for a speleothem to have a steady drip year after year. And in an ever-changing climate and soil environment, each stalagmite responds differently.<sup>21</sup> The drip point for a particular stalagmite should be constantly shifting to new locations, as observed today. Silvestru elegantly states the problem:

“Evolutionists claim speleothems formed over hundreds of thousands of years. But in my own evolutionary days, I had never considered an important

consequence of such an age: the tiny water droplet, which built that stalagmite, had to keep arriving at precisely the same spot on the floor of the cave for 100,000 years! … Well, I knew—and all karstologists know—that the surface of limestone terrains above caves changes dramatically in short periods of time. And any change at the surface also changes the location of the water droplets inside the cave. However, the stalagmites do not indicate any changes. So, the conclusion is simple: they cannot be that old. And that fact indicates the old-age belief is fallacious.”<sup>22</sup>

#### The Flood origin of the cave openings

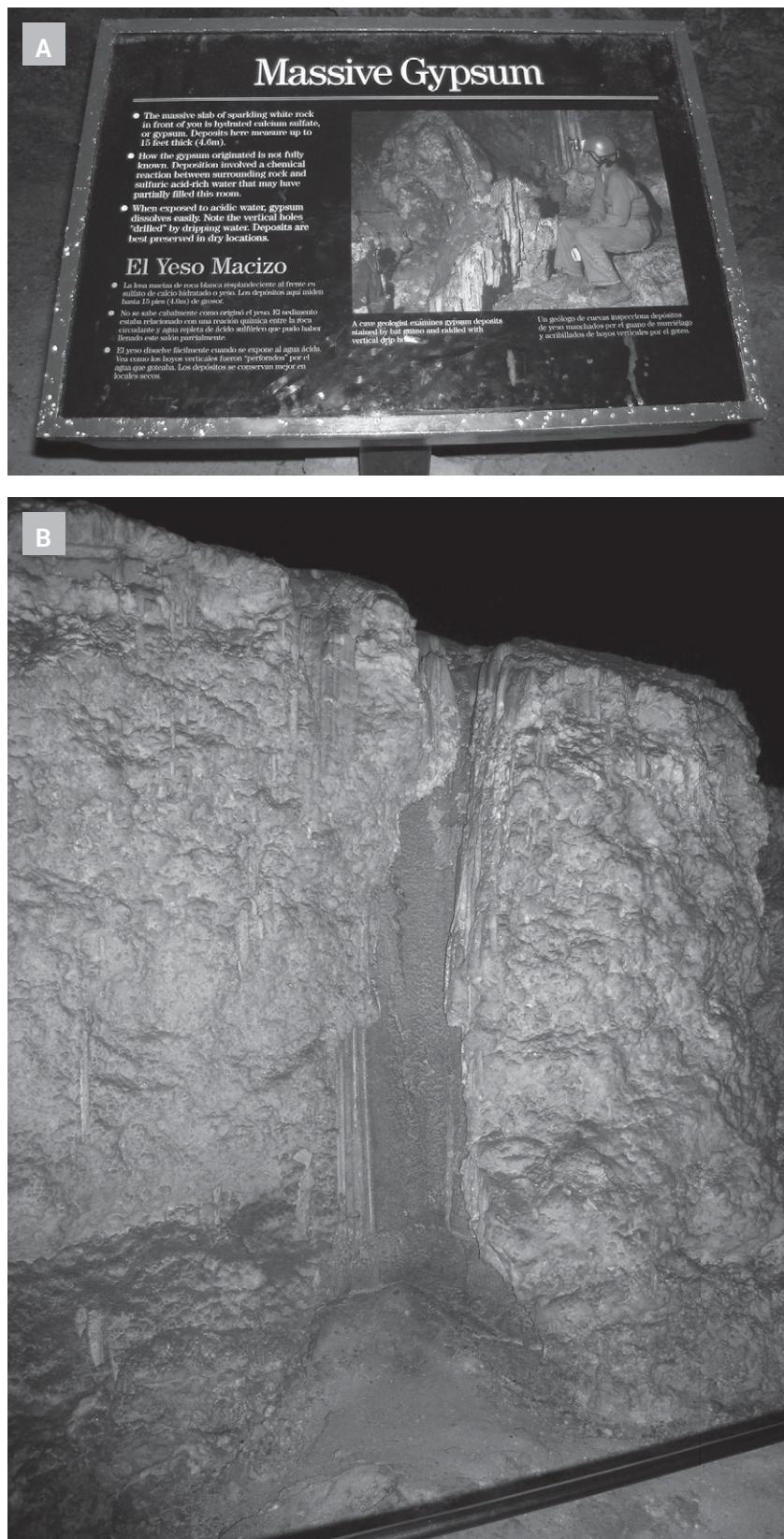
Before spectacular speleothems are formed, we need a cave. Caves are almost entirely formed in carbonates, but there are a few formed in ‘evaporites’ and even in sandstone. An evaporite is a chemical sedimentary rock believed to have formed from evaporation, such as salt or gypsum.<sup>23</sup>

#### Caves first, speleothems second

It appears that cave openings formed first. When the dissolution of the cave stopped, the process was reversed and carbonates (speleothems) were deposited inside the caves.<sup>24</sup> If both dissolution and deposition occurred at the same time, there should be a chaotic mixture of features that record ongoing periods of dissolution and deposition. These do not exist. Uniformitarian scientists have great difficulty figuring out how carbonic acid formed near the surface, percolated down, and still maintained enough acidity to dissolve cave openings along joints, faults, and weak bedding planes. They say creationists have a worse problem—time. But whilst the biblical timescale allows only a little more than 6,000 years<sup>25</sup> the Flood and Ice Age provided unique conditions that would facilitate rapid cave formation. Cave openings would have formed rapidly during the Flood and a little afterwards, and the speleothems formed during the rapid, post-Flood Ice Age.<sup>26,27</sup>

#### Caves excavated by sulfuric acid

A recent discovery made by uniformitarian scientists provides a more viable process for cave formation than carbonic acid. It was first hypothesized in the 1970s that caves could be excavated by sulfuric acid, possibly aided



**Figure 7.** A) Sign in front of a massive gypsum deposit, Carlsbad Cavern, New Mexico, USA; B) Massive gypsum, Carlsbad Cavern, New Mexico, USA.

by microbes.<sup>28</sup> Then, based on certain cave minerals such as elemental sulfur, gypsum, halloysite, and alunite, sulfuric acid speleogenesis was recognized in other areas of the world, especially Carlsbad Caverns and other caves of the Guadalupe Mountains of south-east New Mexico.<sup>18,29,30–32</sup> These are called *hypogene caves* as opposed to those supposedly formed by carbonic acid, which are called *epigenetic caves*. The Guadalupe Mountains caves were formed in what has been considered a classical ancient reef, the ‘Capitan Reef’, which supposedly formed during the ‘Permian’ over 250 Ma. However, some geologists consider it unlikely to be a true reef: “The massive block is usually called a ‘reef’, but it shows few characteristics of a true reef.”<sup>33</sup>

Gypsum is a product of sulfuric acid dissolution of carbonate. It is abundant in Carlsbad Caverns, where it can be over 4 m (13 ft) thick on the floor of the Big Room (figures 7a and 7b). It is believed H<sub>2</sub>S from nearby oil deposits to the south-east formed the sulfuric acid that dissolved the limestone at Carlsbad Caverns and nearby caves. This is uncertain, since it is not observed occurring today. All researchers know is that the δ<sup>34</sup>S value of the gypsum indicates that the sulfur products are biogenic. Alunite apparently can be dated by the <sup>40</sup>Ar/<sup>39</sup>Ar dating technique, which provided the incentive for geologists to investigate the above reaction products.<sup>18</sup>

In light of this direct evidence for sulfuric acid dissolution, it was once claimed that 10% of caves worldwide were formed by sulfuric acid dissolution.<sup>34</sup> The other 90% of caves were explained by the dissolution by carbonic acid.<sup>34</sup> However, cave scientists are discovering more and more caves were excavated by sulfuric acid. In the preface of a 2017 book on the topic of hypogenic caves, the editors state:

“More attention to hypogene karst since 1990, and particularly

the dramatic burst of studies in this field during the last decade, has changed our notion of hypogene karst from a curiosity to one of the fundamental categories of karst, at least of compatible importance with more familiar epigene karst. ... Hence, the potential for the development of hypogene karst is immense, not only in the continental domain but also in the oceanic domain. ... Moreover, even in Europe and North America, many areas have been recognized only recently to host hypogene karst, and its study is still ongoing. This means that next editions or volumes under this title will be needed.”<sup>35</sup>

The editors believe that the hypogene caves were formed by ascending hydrothermal water and that caves can form up to 2 km deep. The book is over 700 pages long and describes a large number of hypogenic caves all over the world. There are now so many hypogene caves that cave expert Klimchouk states that “this phenomenon can be globally even *more* widespread than epigene karst [emphasis added].”<sup>36</sup> Twenty-five percent of hypogene caves are found in Italy.<sup>37</sup> This means that it is likely that more than 50% of caves are hypogenic. It could be 100% of caves are hypogenic, especially since it is difficult to tell epigenic from hypogenic caves.<sup>38</sup> They also believe that hypogene caves are mostly relic, not forming today, and that they formed deep down and were brought to the surface by uplift and erosion.<sup>39</sup>

#### Rapid sulfuric acid dissolution during Flood uplift

This new information opens up the distinct possibility that many cave openings were excavated rapidly during the Flood by sulfuric acid. However, there could be other powerful acids also available in hydrothermal water,<sup>40</sup> that could excavate cave openings rapidly. Sulfuric acid formed from the oxidation of hydrogen sulfide ( $H_2S$ ) in water would have dissolved the cave opening in a short time.<sup>32,41</sup> The  $H_2S$  would come from decaying organic matter (as also indicated by the biological signature of  $\delta^{34}S$ ) which would be highly concentrated in the sediments after the Flood due to the burial and pulverization of the rich pre-Flood biosphere.<sup>42</sup> The acids need not ascend as believed for the Guadalupe Mountains caves, but likely descended during Flood uplift of the area. Evidence for high-speed flow of acidic water is shown by the large amounts of gravel, cobbles, and boulders, not of carbonate, that are found in many caves.<sup>40</sup> The caves used to be *underground rivers*. Once an opening is fairly wide, turbulent flow would occur. This would excavate carbonates many times faster than in laminar flow<sup>43</sup> because the retarding kinetic effects due to a boundary layer are mostly erased in turbulent flow.<sup>1</sup> The cave openings would then be rapidly enlarged by dissolution. The purity of gypsum in Carlsbad Cavern is one indication of rapid excavation and deposition.<sup>29</sup>

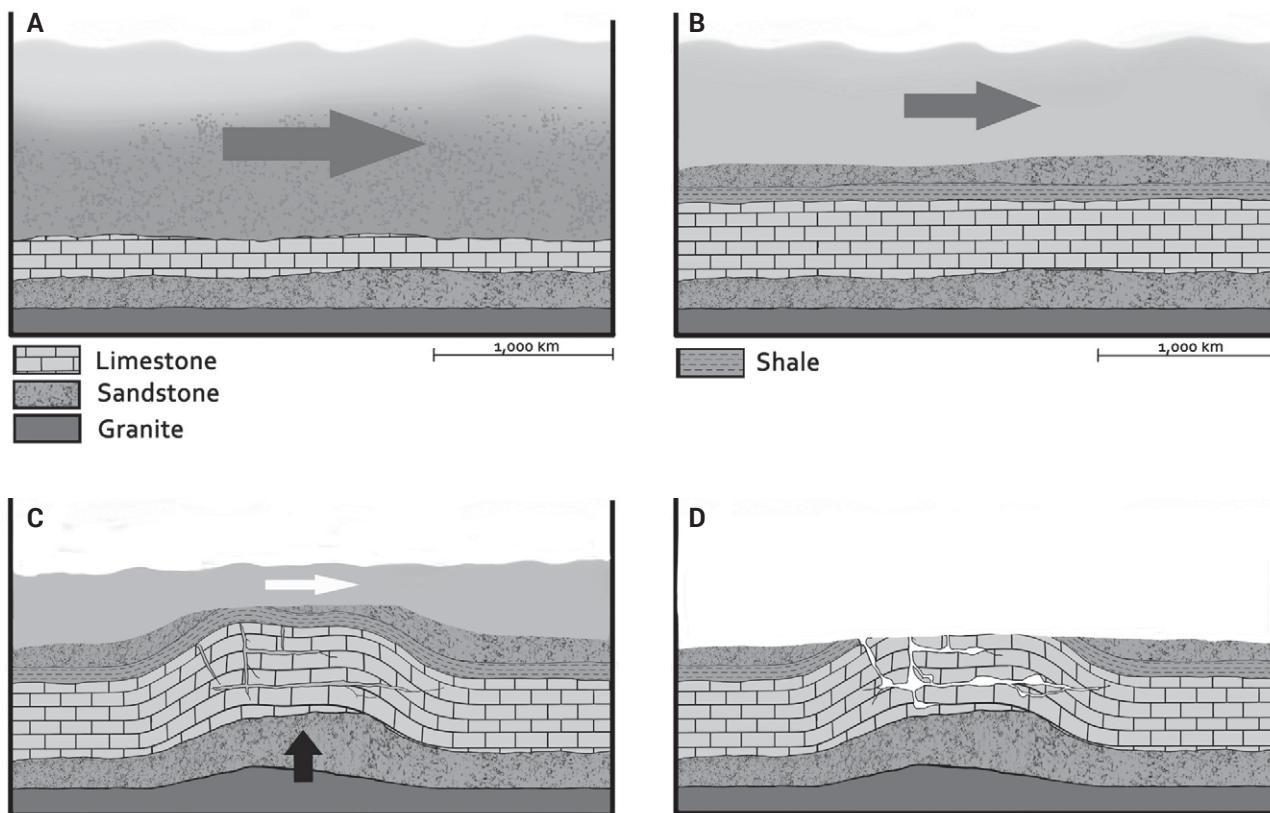
Sulfuric acidic excavation of cave openings is likely best placed within the middle and late Flood, and possibly a little afterwards (figure 8). First, thick, extensive carbonates were laid down and solidified during the Inundatory Stage of the Flood (figures 8a and 8b).<sup>44</sup> Since carbonates have their own cement (calcite), they would likely have solidified rapidly. Second, during the Recessional Stage there was widespread uplift, which was also a massive erosional event on the surface of the continents (figures 8c and 8d).<sup>45,46</sup> The carbonates would have easily cracked, forming joints and faults, since uplift causes expansion and differential movement of rock. This cracking would have extended deep within the carbonates.

Since the sediments and sedimentary rocks freshly laid down in the Flood would have been fluid-rich and likely hot, the chemical-rich water from the Flood would have raced through the joints, faults, and weaknesses in the bedding planes, rapidly dissolving the limestone and creating caves (figure 8c). Numerous caves form rectangular mazes guided by joint and fault patterns and bedding plane weaknesses, reflecting this pattern expected from the Flood and its immediate aftermath.<sup>47</sup>

The Guadalupe Mountains, a dissected planation surface, show evidence of such a timing.<sup>48</sup> J. Harlen Bretz, of Lake Missoula flood fame,<sup>49,50</sup> has shown that the caves were excavated *before* the area was planed. Valleys and canyons cut through caves, and some caves are in relatively narrow ridges and could not form from any soil at the top of the ridge.<sup>51</sup> The caves also do not conform to the topography.<sup>52</sup> This strongly suggests that the caves were excavated near the beginning of uplift, possibly in the Zenthitic Phase in Walker’s biblical geological model.<sup>44</sup> Excavation was so rapid that the caves were already formed before the end of the planing event of the Abative Phase.<sup>45,53</sup>

Even if the dissolution products of sulfuric acid are not found in some caves, they could quite easily have been washed out during Flood drainage. It makes sense that gypsum and other products of sulfuric acid reactions would wash out of the cave, since the Flood water draining through the cave networks would be much more substantial than the water draining out at present. It is also possible that present processes have obscured or covered up the evidence for sulfuric acid speleogenesis.<sup>54</sup> Moreover, the sheer dominance of the carbonic acid paradigm in cave research contributes to the slow acceptance of a more widespread hypogenetic origin for caves.<sup>55</sup> Silvestru states in regard to the Jenolan Caves in Australia:

“Though recently hailed as the world’s oldest (340 Ma) open cave system, the Jenolan Caves system can be explained as the result of hydrothermal karsting during the final stages of the Noahic Flood, subsequently reshaped and disorganized by meteoric speleogenesis and surface erosion.”<sup>56</sup>



**Figure 8.** Schematic of the deposition of carbonates during the Flood (A and B) followed by the Recessional Stage uplift and cracking of the carbonate (C), forming caves by rapid sulfuric acid dissolution (C and D) (by Melanie Richard).

## Summary

Uniformitarianism has several problems explaining caves and their speleothems. First, the idea of cave openings dissolved by carbonic acid from the surface is problematic. Carbonic acid is neutralized quickly as it sinks through the cracks in the vadose zone. Second, although secular scientists claim the entire process took millions of years, the youth of speleothems contradicts this idea. Third, large speleothems imply long-lasting dripping at one location, but because of the changes in water routing, the drips would change location frequently, making it nearly impossible to build up a large speleothem.

A paradigm shift is taking place on the origin of cave openings. Scientists have discovered that many caves, possibly most of them now, have been excavated by sulfuric acid because the products of the carbonate dissolution have been left in the cave. This fits well with the biblical paradigm. The cave openings could have been rapidly excavated during uplift in the Recessional Stage of the Flood.

In part 2,<sup>1</sup> we will shift from the excavation of the cave openings to the conditions needed to form the speleothems, while in part 3<sup>2</sup> we will show that the unique features of the post-Flood Ice Age can account for the growth of the main volume of the speleothems.

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# Out of Babel—not Africa: genetic evidence for a biblical model of human origins

Jeff Tomkins

The recent human evolution story is a quagmire of ever-changing speculations that vary and conflict in their dates and geographical specifics with each new paleoanthropological or archaic DNA sequence discovery. The current general consensus is often termed the recent out-of-Africa model that postulates anatomically modern humans migrated out of Africa about 100,000 to 200,000 years ago. While various versions of the hypothetical evolutionary story exist, an increasing body of research in both the creationist and secular spheres is vindicating the Bible's timeline of a global-Flood-based genetic bottleneck about 4,500 years ago and a recent creation about 6,000 years ago. In this review, I cover the overwhelming evidence from genetics research of various flavors that fully vindicates a biblical picture of human origins.

**D**uring the 1980s and early 1990s, much of secular paleoanthropology was equally divided on how modern humans originated between one idea known as multiregionalism and the other known as Recent African Origins (RAO). The multiregionalism model proposed that humans evolved in different parts of the world simultaneously, with various genes being spread through intermixing and interbreeding. The RAO proposed that humans first evolved in Africa and then dispersed out from there across the world. During the 1990s, especially after the publication of the African Eve hypothesis, the RAO began to rapidly pervade academic circles and has since become the dominant model along with many twists and variants to its central premise.<sup>1</sup>

The fossil record for human evolution is filled with gaps. Thus, inconsistencies and biogeographical confusion abound and scientists have begun to look to the emerging field of DNA analysis. Starting with the mitochondrial DNA work of Cann, Stoneking, and Wilson in 1987 and steadily progressing from there using more advanced technologies, the RAO model began to pick up speed and eventually dominated the academic landscape. The general idea is that mitochondrial and nuclear DNA diversity is greatest in Africa, and, based on known human diversity along with a whole host of other questionable genetic assumptions, which are based in turn on a neutral model of evolution (see Carter 2009),<sup>2</sup> humans evolved in Africa about 100,000 to 200,000 years ago, with specific dates and out-of-Africa migration events depending on the model theorist(s).

Just as the RAO seemed to reach its peak of acceptance, the emerging field of ancient DNA sequencing revealed that admixture between anatomically modern humans and Neandertals and Denisovans had taken place. This was quite surprising because: 1) Neandertals were not supposed to be part of the African origins, and so were not supposed

to be *Homo sapiens*; and 2) Denisovans were completely unknown. RAO sub-models then quickly began emerging to account for this inconvenient data. According to recent reviews, four main human origins models now exist and compete with one another:

1. RAO (classic): Modern humans first developed in Africa about 100,000 years ago and then migrated throughout the world. Existing archaic human populations (i.e. Neandertal and/or *Homo erectus*) in various areas of the world were then replaced by the RAO migrating populations, with little to no hybridization between the populations.
2. RAO With Hybridization: This model is similar to the classic RAO above, but includes a greater level of hybridization taking place between the migrating populations and the indigenous archaic populations being encountered and displaced.
3. RAO Assimilation: This model, like the other two above, accepts a recent African origin for modern humans. Unlike the previous two models, it includes replacement and/or extensive migration of populations as the major driving factor in the emergence of modern humans. This model focuses on the importance of pervasive gene flow and population admixture in conjunction with changing environmental conditions.
4. Multiregionalism: This model denies a recent African origin for modern humans, based on biogeographical data that continue to emerge from paleontology and archaeology. This model also promotes the role of broadscale genetic continuity over time and gene flow between populations. The basic premise is that modern humans arose not only in Africa, but also in Europe and Asia from their *H. erectus* type Pleistocene ancestors.

If this quagmire of competing models was not confusing enough, researchers are at odds concerning the origins of

modern human within Africa before the alleged global dispersion(s) ever occurred. As noted by Henn *et al.* in 2018, there are four of these submodels competing with each other.<sup>1</sup> The first is known as African multiregionalism, which maintains that there were multiple points of modern human origins across Africa, with continuing admixture between populations. The second proposes that there was a single point of origin, with range expansions and local extinctions, but with one line predominating. The third proposes that there was a single point of origin, with range expansion and one line predominating, but slightly lesser-evolved populations breaking off shortly before the dispersion, and occasional admixing. The fourth proposes that there was one point of modern human origins, with multiple lines of archaic humans evolving side by side with a small amount of admixture occurring shortly before the dispersal.

### **Archaic DNA sequencing deepens the RAO quagmire**

The field of archaic human DNA sequencing, along with massive-scale sequencing of numerous genomes of modern humans worldwide, has completely revolutionized the secular field of human evolution. In these studies, the nuclear genomes of multiple archaic Neandertals and Denisovans have been sequenced at various levels of completeness. In addition, an even larger number of mitochondrial DNA sequences have been obtained. Instead of confirming evolutionary predictions, especially those associated with the RAO model, the results have brought more questions than answers.<sup>3</sup>

Neandertals are known by both archaeological and paleontological findings and are believed to have lived in the Middle East, Europe, and various regions in Asia. In contrast to the rich amount of evidence for Neandertals, Denisovans are only known from ancient DNA extracted from a single finger bone and three teeth and are thought to have inhabited parts of East and South-East Asia. Anatomically modern humans are thought to have existed about 300,000 years ago, based on the recent fossil finding in North Africa at Jebel Irhoud.<sup>4,5</sup> However, Neandertals are believed to have lived from 450,000 years ago up until only 40,000 years ago.<sup>3</sup> Thus, modern humans and their archaic cousins are believed to have overlapped both in time and geography.

Not surprisingly, archaic human DNA is nearly identical to that of modern humans, although its sequence quality can often be questionable.<sup>6</sup> According to the consensus creationist model, Neandertals are nothing more than people groups of post-Flood humans. However, evolutionists are in a constant quandary over their interbreeding (admixture) with anatomically modern humans, despite the fact that so-called archaic traits like sloping foreheads and pronounced brow

ridges can still be found among modern humans today. Along these lines, the ever-increasing timeline of admixture is causing confusion for the RAO.

The first major discrepancy for RAO that came from archaic DNA studies arose when it was discovered that modern non-African humans shared higher levels of genetic ancestry with archaic humans than they did with African populations.<sup>7</sup> Making matters worse, a 2017 study of mitochondrial DNA showed that anatomically modern humans were admixing at least 270,000 years ago, pushing the date beyond the outer limit of about 200,000 years for RAO.<sup>8</sup> But the evolutionary confusion for RAO has now gotten much worse. In 2019, an extensive genomic analysis of archaic and modern human genomes has shown that large segments of Neandertal chromosomes span across centromeres, where recombination does not occur. These segments have also been found to span across 21 different genic regions, yielding a 600,000-year timeline to the last common ancestor between humans and Neandertals.<sup>9</sup> This new DNA study, using the evolutionists' own system of reckoning, triples the RAO maximum.

And now, a recent 2020 study has thrown yet another wrench into the evolutionary machine of the RAO paradigm which shows that genomic regions of Neandertal ancestry are present in individuals of African descent at much higher levels than previously believed.<sup>10</sup> The RAO advocates have attempted to explain this anomaly by claiming that humans with Neandertal ancestors migrated back down into Africa from Europe on multiple occasions, spreading their genes among African populations.

### **Mitochondrial genetic clocks refute RAO**

The evolutionary molecular genetic clock has a long and nefarious history in the annals of modern biology (reviewed by Tomkins and Bergman in 2015).<sup>11</sup> The general paradigm of an evolutionary genetic clock typically uses an alignment of multiple DNA sequences, along with a variety of statistical models to provide rates of hypothetical evolution—often between unrelated taxa that most creationists would deem separate created kinds. Standard genetic clock studies routinely use deep-time calibrations derived from paleontology and assume a paradigm of macroevolution. And quite notably, clock-derived divergence dates commonly conflict with those taken from paleontology, despite the fact that deep-time calibrations are built into the algorithms. This is consistently true with analyses of human evolution that also add further bias by using chimpanzees as an evolutionary ancestor outgroup.<sup>2</sup> Needless to say, this type of approach is not empirically based.

So what kind of genetic clock data could be achieved if the evolutionary assumptions were not used and an empirical

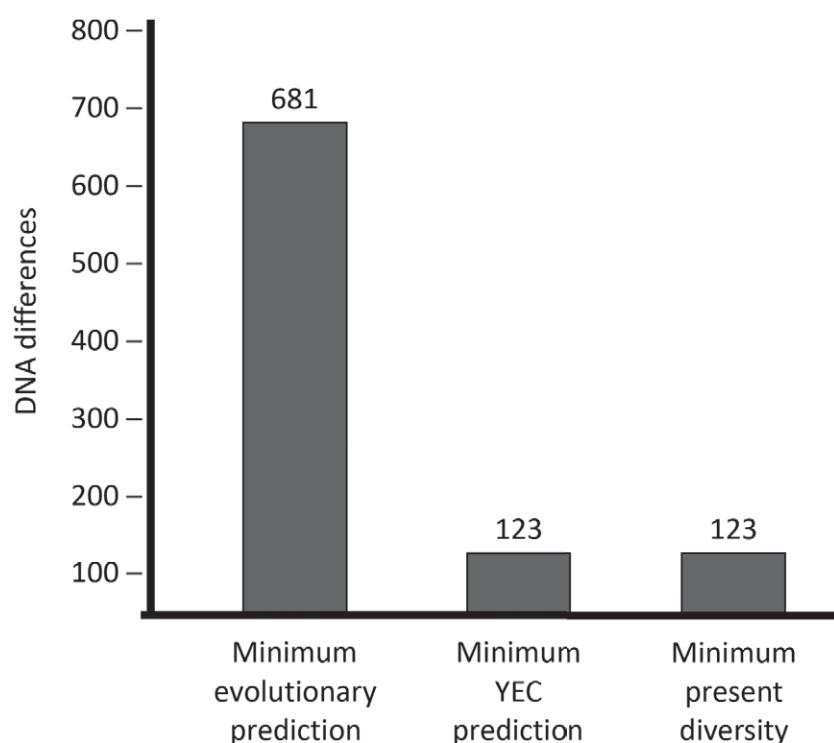
approach to the analysis was taken? As it turns out, research by both secular and creation scientists indicates a date of modern human origins of not more than 5,000 to 10,000 years (reviewed by Tomkins in 2015).<sup>12</sup> For the purposes of this current review, I will briefly summarize these earlier findings before describing more recent efforts that confirm and refine them.

Evolutionists first noticed a problem with their paradigm in 1997 when human mitochondrial DNA mutation rates were first being analyzed.<sup>13</sup> As stated in the original paper: “Using our empirical rate to calibrate the mtDNA molecular clock would result in an age of the mtDNA MRCA [most recent common ancestor or the first human woman] of only ~6,500 years.” This study was ridiculed and maligned, not for the methods used, but for the young age of the non-evolutionary conclusions that were reached.<sup>14</sup> In 2012 and 2013, two major secular papers were published that each analyzed the rare mutational variants in human protein coding exons among ~9,000 individuals of various ethnicities and found that, based on demographic models, as opposed to standard evolution-calibrated models, the rare mutational variation in the human genome could be no older than 5,000 to 10,000 years.<sup>15,16</sup>

While these secular studies were extremely revealing, and directly opposed the timeline claims of RAO, creationist

researchers, unhindered by constraints of political academic correctness, began to refine the model further. In 2013, Jeanson demonstrated that the empirical mitochondrial DNA mutation rate in round worms, fruit flies, water fleas, and humans gave a maximum creation age for each of them of not more than 10,000 years ago.<sup>17</sup> Jeanson’s results for humans lined up well with the research of Sanford and Carter, who statistically compared over 800 mitochondrial DNA sequences and reconstructed a close approximation of ancestral Eve’s original mitochondrial genome.<sup>18,19</sup> They showed that, on average, any given human is only about 22 mutations different than the ancestral Eve sequence, although some may be as many as 100 mutations different. Based on an empirical estimate of human mitochondrial DNA mutation of about 0.5 per generation, as reported in the literature, they estimated that 200 generations would be needed to accumulate 100 mutations—a time of less than 6,000 years. In 2018, Carter, Lee, and Sanford further refined the mitochondrial DNA Eve consensus sequence and even developed haplogroups.<sup>20</sup> A haplogroup is a group of genomic variations that are inherited together from a single parent. This work further vindicated a single ancestral genome and also helped to provide some clarity on the dispersion of post-Flood people groups originating in the Middle East, in contradiction to the claims of RAO.

Outside of the reconstructive work by Carter for the ancestral mitochondrial Eve genome, most early mutation rate studies had only been done with what is known as the D-Loop region which represents a mere 7% of the total sequence (16,569 base pairs). Also, these analyses had only been done in non-Africans. It is the evolutionary belief that an increased amount of mitochondrial DNA diversity in Africans is indirect evidence for the RAO.<sup>2</sup> While these earlier studies gave strong indication of a young-earth timescale, more work needed to be done to confirm the original findings. In 2015, Jeanson utilized newly available data sets of complete mitochondrial DNA genomes and showed that the mutation rate in European individuals fully matched with a 6,000 year timescale and fully captured the mitochondrial DNA diversity in non-African people groups.<sup>22</sup> His results included the major Eurasian people groups and representative individuals



**Figure 1.** Predictions of mitochondrial DNA diversity for the evolutionary model and the young-earth creation model compared with the actual diversity observed. As can be seen, the actual empirical data matches the creation model (from Jeanson<sup>22</sup>).

of native people groups in the Americas. Most importantly, his predictions used a mutation rate based on the entire mitochondrial genome that not only affirmed the previous rate derived from just using the D-Loop, but soundly refuted the evolutionary RAO timeline (figure 1).<sup>22</sup>

But what about the diversity among Africans? In a follow-up study, Jeanson investigated the global mitochondrial DNA diversity further, incorporating African and Asian data and also included improved information on generation time based on demographics.<sup>22</sup> Surprisingly, he found that African females, on average, married much earlier in life (average of 15 to 19 years) than non-Africans, which would increase generation time and thus diversity. And interestingly, the highest divergence was not found among Africans but between an African San individual and an Asian Taiwanese Aborigine. This makes perfect sense because Africans and Asians would have split after the Flood due to the events at the Tower of Babel, from which most ethnic groups would owe their origins. Indeed, Jeanson showed how major mitochondrial DNA lineages followed a maternal ancestry back to the three wives of Noah's sons (figure 2).<sup>22</sup>

The newer 2016 study further clarified this ancestry with the addition of African and Asian data, and also showed how a split leading to the Asian and African lineages post-Flood may have actually occurred before the Flood. One has to keep in mind also the mechanism of pre-Flood ancestries in the different lineages of Noah's sons' wives as well. Nevertheless, the new, more comprehensive data confirmed the material ancestry of three main lineages connected to the three wives of Noah's sons. And finally, the new data also confirmed and extended the earlier results showing the initial estimates of mutation rate based on non-Africans are not only still consistent with a biblical timeline but can be used to predict mitochondrial DNA diversity whether African or non-African.

### **Y-chromosome clocks refute RAO**

While the mitochondrial data has spectacularly confirmed the biblical timeline for the maternal human lineage, what about the data on the paternal side? As it turns out, Y-chromosome analyses are just as revealing. In addition to their early creationist work on mitochondrial DNA, Sanford and Carter also analyzed Y-chromosome diversity among modern humans and found there to be only about 300 mutations, on average, that were different from the consensus sequence for a Y chromosome representing the original Adam.<sup>19</sup> In fact they found that if a normal mutation rate for the Y chromosome of about 1 mutation per generation was assumed, that only about 300 generations corresponding to about six thousand years would be needed to get 300 mutations worth of modern human Y-chromosome diversity.

In 2018, Carter, Lee, and Sanford further refined the history of the Y-chromosome sequence along with similar analyses for the mitochondrial genome.<sup>20</sup> Quite notably, they discovered that both the maternal and paternal unrooted phylogenetic analyses gave very similar results. The first key similarity observed was that the branching pattern displayed in both DNA datasets indicated a large expansion of human people groups, with many new branches being formed from closely related ancestors. The second noteworthy trend was that for both chromosomes, mutation rates along various branches were not the same over time, yet when averaged out, both genomes were less than 10,000 years old. Another interesting outcome from the study was that both phylogenetic trees revealed a starburst pattern centering around specific historical individuals derived from the Middle East. All of the data combined showed that, with a high degree of confidence, the actual sequences of historical individuals that gave rise to each branch in both family trees could be determined, including the ancestral Eve and Adam mitochondrial and Y chromosomes, respectively (within a reasonable level of confidence).

To help further resolve the paradigm of a Y-chromosome genetic clock, in 2019 Jeanson and Holland downloaded newly available sequences for the Y chromosome that were derived from individuals in large human pedigrees. The data were considerably more comprehensive and contiguous thanks to new long-read DNA sequencing technologies.<sup>24</sup> The Y chromosome is particularly useful in studying human pedigrees, common variants, and mutations, because it has no chromosomal counterpart in the human genome with which to exchange genetic information during meiotic recombination. Thus, the Y chromosome is more genetically homogenous than the autosomes and is thus extremely useful in genetic clock studies. In this study, they noted that if humans have actually been around for several hundred thousand years or more, according to RAO they should have accumulated 8 to 59 times the amount of mutations that we currently observe in Y chromosomes worldwide. Quite notably, they empirically proved that we can only observe about 4,500 years of mutation accumulation in all of human paternal ancestry, as documented in the record of the human Y chromosome.

### **Genetics corresponds to linguistics**

A variety of studies have analyzed genetic diversity in relation to language for isolated regions of the world such as Europe, India, South and Central America, parts of Africa, etc., but none have done this type of work on a global level.<sup>25</sup> The initial efforts had been purely asymmetrical in their approach in comparing DNA with various languages. In other words, some studies had focused purely on the genetic

analysis and then used linguistics to interpret the findings, while other research analyzed linguistic data and then attempted to interpret the results with genetics. Therefore, little is known about the development of global human demographics because few studies combined genetics and language data in the same analysis.

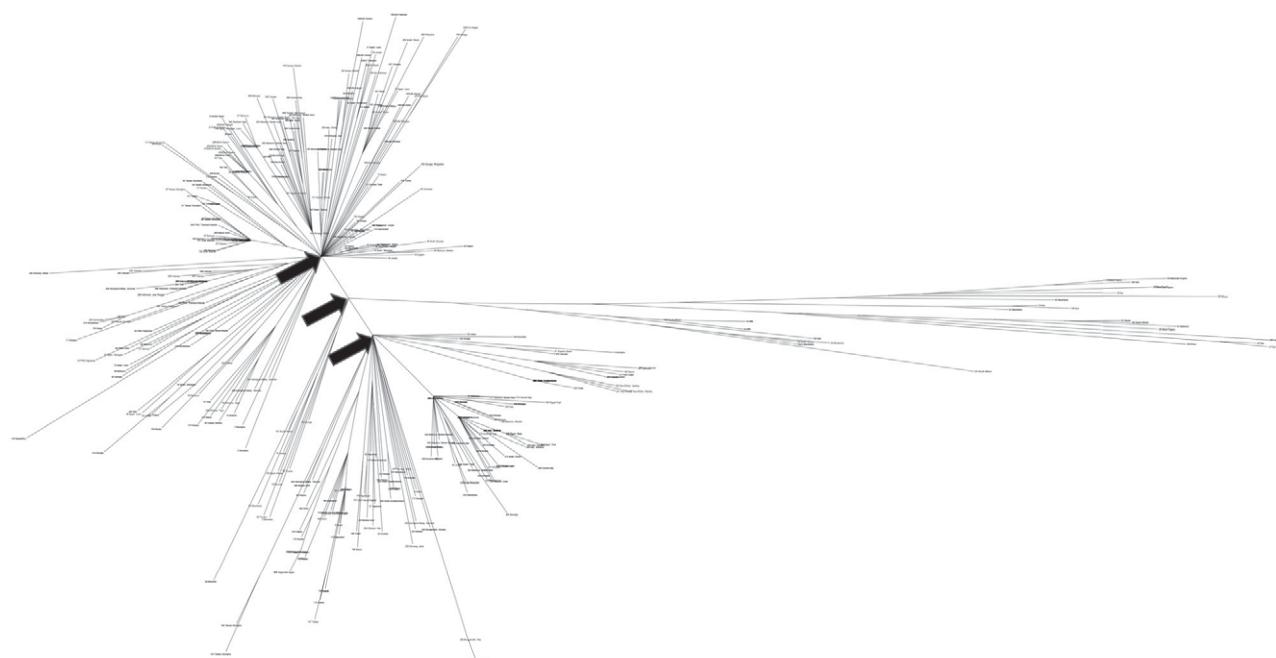
A fairly recent secular study of direct interest to the creation science community was reported in 2015. It supports a language-based mechanism for the biblical account of human ethnic group origins, i.e. the confusion of languages and the Babel dispersal shortly after the Flood.<sup>25</sup> This study was unique because it combined data from three important fields: language, genetics, and demographics. The researchers analyzed the largest available datasets of distinct sound units in a language, called *phonemes*, in 2,082 global languages and combined this with genetic profiles based on common DNA variants derived from 246 different people groups. They stated: “On a global scale, both genetic distance and phonemic distance between populations are significantly correlated with geographic distance”; and, “There is a relationship between human dispersal and linguistic variation.” Thus, the data derived from this extensive study confirmed the close tracking of both language and genetics for people groups across the globe, but the revealed migration patterns did not follow evolutionary RAO predictions. The researchers also stated: “However, the geographic distribution of phoneme inventory sizes does not follow the predictions of a serial founder effect [single lineage of descent] during

human expansion out of Africa.” In other words, there was no clear dispersal pattern coming *out of Africa* according to the popular RAO dogma.

This author fully recognizes that languages and genetic histories are complex and often don’t directly correlate and that this data cannot be used to reconstruct a clear global picture of descent from Babel. Nevertheless, these results challenge the evolutionary RAO idea of a single lineage of languages and human populations evolving in Africa and then dispersing from there globally.<sup>25</sup> While the researchers believed the genetic data by itself offered marginal support for RAO, they were forced to admit that “genetic and linguistic data show similar signatures of human population dispersal within regions”. These results clearly support the fact that modern people groups have multiple origin starting points.

### Genetics correspond to population growth

The Bible presents a variety of historical events and paradigms that allow us to predict population growth and interpret this data within genetics and what we know about the current global population. The three primary biblical events would be the original creation of Adam and Eve about 6,000 years ago, the global Flood which produced a genetic bottleneck whereby the earth was repopulated from Noah’s three sons and their wives about 4,300 years ago, and the



**Figure 2.** An unrooted mitochondrial DNA tree representing 369 individuals of different ethnicities. The large block arrows point to the three major branch nodes believed to correspond to the wives of Noah’s three sons (from Jeanson<sup>22</sup>)

tower of Babel, whereby multiple people groups originated via the confusion of languages.<sup>26,27</sup>

These are major, biblical, and global impacting events. In order to study these and other population growth scenarios, such as the growth of the Hebrew people during the Egyptian captivity, Carter and Hardy developed a sophisticated software program for modelling growth under a wide range of parameters and scenarios.<sup>26</sup> Their software took into account population size, minimum child-bearing age (females and males), pregnancy probability, remarriage rates, and mortality. They found that it was trivial to obtain the current world population (in 2015) at about 7 billion people from an original ancestral founding group of Noah's three sons and their wives. They also affirmed the feasibility of the growth of the Hebrew population during the 430 years of captivity in Egypt, as recorded in detail in the Scriptures.

Building on the population research which vindicated the Bible's chronologies, Carter and Powell began to research the Creation-Flood-Babel model of human origins in terms of population genetics and demographics.<sup>28</sup> They created another population modelling program to examine and model changes in allele frequency. Their model created a hypothetical genome of 100,000 alleles contained in 22 independent chromosome arms, with each arm scaled proportionally to its length in the human genome. In a creation scenario of two individuals, alleles were set to a heterozygous state, representing created diversity. Childbirth was controlled by various population parameters. Recombination events for each chromosome arm in each generation were also varied and the alleles tracked in all individuals. At specified points in the model, bottlenecks could be introduced, such as the one imposed by the global Flood. They demonstrated that a biblical population genetic-growth model can accurately account for the current diversity we see among modern humans. In contrast to evolutionary claims, they showed that there is no reason to reject a literal interpretation of biblical chronology based on the allelic diversity or on the distribution of that diversity. They also showed that the genetic risk factor of diversity loss in the Flood bottleneck was not a problem either. In fact, in a later paper, Carter specifically tackled the question of diversity loss in the Flood.<sup>29</sup> He estimated that the Ark passengers designated to repopulate the earth could have carried up to 77% of the available pre-Flood created allelic diversity. Therefore, the majority of the original created allelic diversity could have been carried aboard the Ark and used to fuel the repopulation of the earth.

In regard to mutation-based alleles, Carter followed up his previous research by showing that patriarchal drive (an increase in gamete mutation with an individual male's age) was not only real, but likely a significant factor in global repopulation post-Flood.<sup>30</sup> This was especially pronounced

during the first few centuries post-Flood where males, on average, still lived much longer than they do currently. As a result, there would be an increase in mutation-based diversity shortly after the Flood during the initial phases of global population growth. Thus, a biblical model of population growth combined with genetic analyses is fully capable of describing both common (created) variant diversity and mutational diversity within modern humans.

In regard to global population growth, Jeanson has recently taken a novel approach by incorporating demographic population growth into his recent Y-chromosome diversity data.<sup>31</sup> His work showed how population growth matches up with lineage splits in his previously published Y-chromosome genetic clock data.<sup>24</sup> A biblical timescale fitted well with the last 4,500 years of human population growth, as reflected in the phylogenetic branching events for the lineages in the Y-chromosome trees, rather than just in the data represented at the tips of the tree. Quite notably, the Y-chromosome and population growth data fitted well with specific shifts in population structure in biblical ancient history, such as the global famine described during Joseph's life as a ruler in Egypt. Such a widespread famine would dramatically have stunted population growth and thus it was detected in Jeanson's genetic branch analyses.

## Summary and conclusion

Based on the biblical chronologies and genealogies in the Hebrew Masoretic text, we know that the global Flood recorded in Genesis occurred about 4,500 years ago. The earth was then repopulated by Noah's three sons and their wives. Furthermore, at the tower of Babel, the confusion of languages imposed yet another event with genetic consequences. As a result of these biblical historical events, it stands to reason that we should find genetic signatures of these events and timelines in human DNA, population growth, and language. As demonstrated in this article, a copious amount of research has been done by both creationist and secular scientists that vindicates the biblical model of human origins and debunks the RAO.

And before much of this research was done in the creationist community, the famous evolutionary geneticist A.R. Templeton aptly foreshadowed the demise of the RAO interpretation of human origins based on genetic data, when he stated in 2005: "The out-of-Africa replacement hypothesis is strongly rejected by the haplotype tree data [genetic-ancestry analyses], and this is also supported by the fossil and current human data."<sup>32</sup>

The new Y-chromosome genetic data brings a huge challenge to the secular science community. While discussing the ramifications of this, Jeanson recently stated:

"I'm anxious to see how the evolutionists try

to dismiss this second, independent line of genetic evidence for the young-earth timescale. Not only do they have to explain why the data contradict evolution, they have to also explain why the data are such a tight match with the predictions of Biblical creation. And they have to do it both for DNA inherited through females, and now also for DNA inherited through males.”<sup>33</sup>

Indeed, the empirical genetics research, especially that done within the creationist community over the past 10 years, is truly a sound dismissal of evolutionary RAO speculation and a huge confirmation for the story of mankind documented in the literal history of the Bible.

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# A new baraminology method based on Whole Genome K-mer Signature analysis and its application to insect classification

Matthew Cserhati

A newly developed bioinformatics method called the Whole Genome K-mer Signature (WGKS) algorithm has been designed and used to analyze the whole genome sequences of 61 insect species from the genera *Aedes*, *Anopheles*, *Culex*, *Drosophila*, and *Glossina*. The results of this analysis have been evaluated from a baraminological viewpoint. The results have also been compared to clustering of the same genera based on whole mitochondrial genome sequence similarity and an analysis of whole proteomes by the Gene Content Method (GCM). All three analyses show that *Drosophila* (fruit flies) and *Glossina* (tsetse flies) are well-defined baramins, but the case with the mosquitoes *Aedes*, *Anopheles*, and *Culex* is more nuanced. The older GCM algorithm clumps all three mosquito genera into one baramin, whereas both the WGKS algorithm and the mitochondrial DNA analyses show that *Anopheles* forms its own baramin, separate from *Aedes+Culex*. The newly developed algorithm is more accurate, since it takes whole genome information into consideration, as opposed to merely the coding regions. With this new algorithm, more precise genetics-based baraminology studies can be performed by taking more genetic information into account. This new algorithm also tends to split groups, as opposed to lumping them together.

**A**new genetics-based bioinformatics algorithm has been developed to analyze and compare the whole genome sequences of any set of organisms.<sup>1</sup> This new algorithm can also be used to perform molecular baraminology studies. Compared to morphology-based baraminology algorithms, genetics-based algorithms have several advantages.

Molecular data is useful where morphological data is inconclusive.<sup>2</sup> Also, all heritable information is encoded in the DNA, meaning that there is much more genetic information than there is morphological data. Furthermore, biomolecules such as DNA record the life history of a species ever since its creation. Mitochondrial DNA (mtDNA) is especially useful for this, because it can recover phylogenies of closely related species.<sup>3</sup>

With the advent of the genomics revolution, an exponentially increasing amount of genetic data is being made available in online databases, much of which has not yet been analyzed. These sequence data include proteome sets as well as whole genomes. Whereas morphology-based data sets suffer from convergence, genetic-based algorithms do not do so as much. Morphology data sets may miss a lot of data points, especially if they were gathered from fossil specimens. Similarly, proteomics data themselves may be incomplete if one doesn't sample all the genes of an organism.<sup>4</sup>

In comparison to proteomics data, genome sequences are usually complete (they may still suffer from low coverage and may also have large segments of undetermined sequences). There is also an advantage to capturing information from the entire genome as opposed to just the protein-coding regions.<sup>2</sup>

The present algorithm is an alignment-free k-mer sequence comparison method. As such, the data are processed much faster than in alignment-based algorithms, which depend on *a priori*-defined guide trees.<sup>5,6</sup> The algorithm, called the Whole Genome K-mer Signature (WGKS) was first tested on 58 species from three insect genera, *Drosophila* (fruit flies), *Glossina* (tse-tse flies) and *Anopheles* (mosquitos).<sup>1</sup>

The mosquito genus *Anopheles* contains 485 species, 60 of which transmit the malaria vector *Plasmodium*. These species are global in their distribution and are studied mainly because of their epidemiological importance.<sup>7</sup> The fruit fly genus *Drosophila* includes a similarly large number of species. It is widely distributed in the northern hemisphere and is divided into five lineages.<sup>8,9</sup> *Drosophila melanogaster* is a well-known experimental animal due to its easy culturing, high generation time, and small body size. The genus *Glossina*, with around 20 species, is studied due to its economic and medical importance since it spreads trypanosomes; it has several subgenera.<sup>10</sup>

With this new baraminology algorithm we have a new tool which we can compare with existing tools currently used for baraminological analyses. This should make baraminology studies more precise.

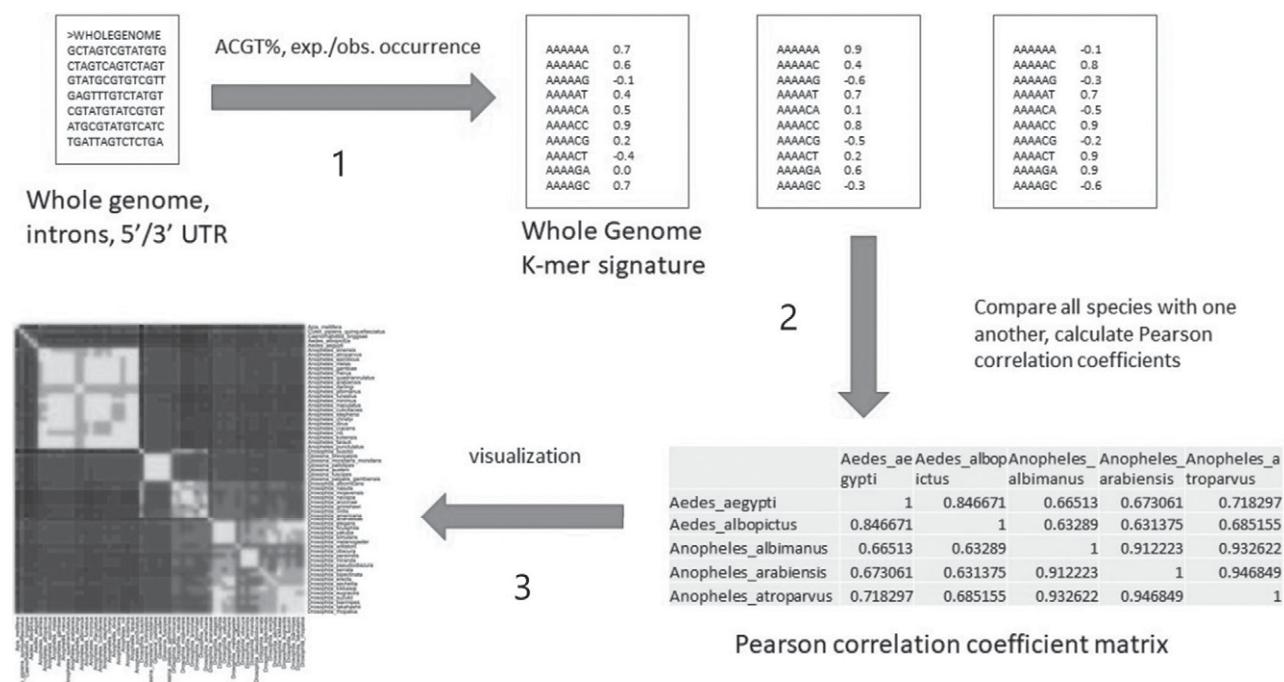
## Materials and methods

### The Whole Genome K-mer Signature algorithm

The goal of the WGKS algorithm is to generate and compare the k-mer content of the genomes from all species

in a given study. A k-mer is defined as a segment of DNA  $k$  bp long. In the Cserhati *et al.* study,  $k$  ranged from seven to nine (heptamers, octamers, and nonamers). K-mers of such lengths can act, for example, as transcription factor binding sites (TFBSs).<sup>11</sup> In baraminology we may assume that species from the same baramin will have similar genomes, since they are interrelated. Therefore, they should also have a similar k-mer content. This is because, within a baramin, individual species originating from the archebaramin (those species created during Creation Week representing a given baramin) would have undergone relatively little differential mutation after the Fall. Species from different baramins are assumed to have different genomes, even different chromosome numbers, or genome sizes. Therefore, we predict that their k-mer content should be very different. It is highly unlikely that very different organisms would have a similar k-mer content, since a high percentage of the genome does not consist of junk DNA but is functional (i.e. TFBSs, enhancers, silencers, etc.). For example, 80% of the human genome was assigned some biochemical function by the ENCODE Project in 2012, but this percentage could be even higher.<sup>12</sup>

An overview of the algorithm used in this study can be seen in figure 1. The algorithm is made up of three steps: 1. The generation of the WGKS for each species; 2. Comparison of WGKS between all possible species pairs and generation of similarity matrix; and 3. Visualization of similarity values on a heat map and prediction of species clusters (baramins).



**Figure 1.** Flow diagram for the Whole Genome K-mer Signature algorithm. The input is a genomic or sub-genomic region, such as the whole genome sequence or the 5' UTR. In the first step, the k-mer signature is derived for all species. In the second step, the k-mer signature for all species is compared to one another to get a PCC matrix. In the third step, the PCC matrix is visualized on a heat map.

occurrences of a given k-mer there are three possible trends:

3.  $O \gg E : S_{k\text{-mer}} \rightarrow 1$  (over-represented k-mer)
4.  $O \ll E : S_{k\text{-mer}} \rightarrow -1$  (under-represented k-mer)
5.  $O = E : S_{k\text{-mer}} \rightarrow \approx O$  (randomly occurring k-mer)

For example, a k-mer that occurs four times more frequently than expected by random chance has a score of  $(4-1)/(4+1) = 0.6$ .

The score distribution of octamers for *A. gambiae* is depicted in supplementary figure 1A. It is evident that the score values follow a bell-shaped curve. Supplementary figure 1B shows the Q-Q plot of the same values.

#### Comparison of WGKS between species

Once the WGKS has been calculated for all of the organisms in the study, we can compare the species on an all-versus-all basis. The WGKS can be transformed into a vector of numbers by sorting the k-mers in alphabetical order (A...A to T...T). This gives us a list of  $4^k$  score values. Two species vectors can be compared by calculating the Pearson Correlation Coefficient (PCC) value for them. The PCC can be calculated in the following way:

$$6. PCC = r_{xy} = \frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^n (x_i - \bar{x})^2} \sqrt{\sum_{i=1}^n (y_i - \bar{y})^2}}$$

Here x and y represent a vector of k-mer scores from two different species. They are the same length, because they cover the same  $4^k$  k-mers. A PCC has a value between -1 and 1. The more similar the WGKS between two species (same baramin), the closer the PCC value is to 1. Species from a different baramin have a lower PCC value.

#### Visualization on heat maps

After computing all pair-wise WGKS values, a symmetrical square matrix can be derived that contains PCC values for all possible species pairs. The PCC matrix can then be visualized with a heat map. Brighter shades correspond to PCC values closer to 1 denoting species with a similar WGKS, belonging to the same monobaramin. Darker shades correspond to PCC values with more negative values denoting species with a different WGKS, belonging to different baramins. Heat maps were created using the heat map function in R. Clustering was done using the ‘average’ algorithm for the WGKS method, the ‘ward.D2’ algorithm

for GCM, whereas the ‘single’ algorithm was used to depict the mitochondrial data.

#### Sequence data

The whole genome sequences for all 61 insect species in the WGKS study were downloaded from the NCBI Genome Database ([ncbi.nlm.nih.gov/genome](http://ncbi.nlm.nih.gov/genome)). Proteome sets were downloaded for 44 species of *Aedes*, *Anopheles*, *Culex*, *Drosophila*, and *Glossina* from [uniprot.org/proteomes](http://uniprot.org/proteomes). Mitochondrial genomes for 98 species of *Aedes*, *Anopheles*, *Culex*, and *Drosophila* were downloaded from the NCBI website at [ncbi.nlm.nih.gov/genome/browse#!/overview](http://ncbi.nlm.nih.gov/genome/browse#!/overview). An all-versus-all BLAST comparison was performed using the ggsearch36 command line software (version 36.3.8), downloaded from [faculty.virginia.edu/wrpearson/fasta/fasta36/fasta-36.3.8h.tar.gz](http://faculty.virginia.edu/wrpearson/fasta/fasta36/fasta-36.3.8h.tar.gz).<sup>13</sup> This software provides a faster, more accurate, and more sensitive alignment of sequences than many other aligner programs.

#### K-mer analysis script and plots

A python script was written to calculate the 61 insect octamer ( $k = 8$ ) WGKS vectors. The script is available at [github.com/csmatyi/motif\\_analysis](https://github.com/csmatyi/motif_analysis). All plots were made in R version 3.4.3. These include the beeswarm, ECDF and silhouette plots, using the beeswarm, cluster, fpc, NbClust libraries, and the ecdf and eclust commands. The eclust clustering command was run for three to five clusters for the results of the mitochondrial and GCM analyses. The cutree command was used to determine clusters for the WGKS method. The beeswarm plot depicts similarity values on the y-axis. The ECDF plot shows the empirical cumulative distribution function curve. In other words, this plot shows the percentage of similarity values below a given similarity value. The silhouette plot shows the silhouette width for each individual species within a given cluster (each cluster shaded by a different colour).

#### Supplementary files

All supplementary data files and figures are available at [github.com/csmatyi/wgks](https://github.com/csmatyi/wgks).

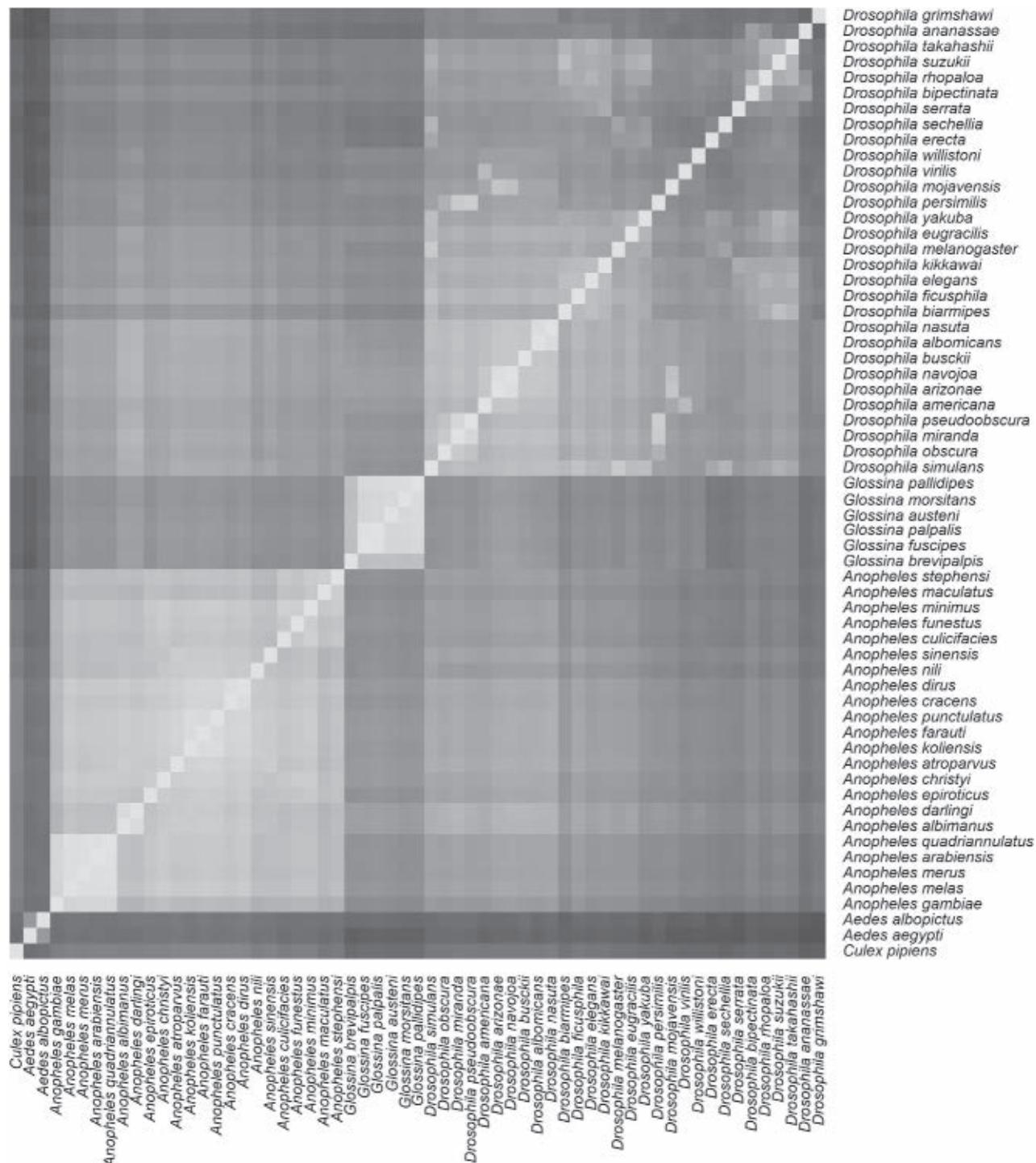
## Results

#### Application of the WGKS algorithm

The WGKS for octamers for 30 *Drosophila*, 22 *Anopheles*, 6 *Glossina*, and 3 outlier (2 *Aedes* and 1 *Culex*) species (61 in total) were calculated and compared with one another. The PCC values were visualized in a heat map in figure 2. The

species list, PCC values, clusters, and clustering statistics are in Supplementary File 1. The Hopkins clustering statistic is 0.85, which means that the data can be clustered well. Based on the Elbow method, four optimal clusters were predicted from the PCC values (supplementary figure 2).

These four clusters correspond to six species of *Glossina*, 22 species of *Anopheles*, 30 species of *Drosophila*, and 3 species of *Aedes* and *Culex*. Table 1 sums up several statistics for the four groups predicted by this analysis. The p-value describes how well the species from a given cluster separate



**Figure 2.** Heat map showing PCC values between 61 species analyzed by the WGKS algorithm. Lighter shades represent PCC values closer to 1, indicating species from the same baramin. Darker shades represent PCC values closer to 0, indicating species from different baramins.

from all other species in the study. To calculate the p-value, those PCC values calculated between species were compared from a given cluster versus those PCC values for all species pairs between a species from the given cluster and a species from the non-cluster. Three p-values are extremely low, but the p-value for *Aedes+Culex* is statistically insignificant (0.433). This could be because only a small number of species from these two genera were included in this analysis. This indicates that the species in this analysis for sure correspond to three putative baramins: *Drosophila*, *Anopheles*, and *Glossina*.

All PCC values were depicted in a beeswarm plot and an ECDF plot in supplementary figure 3A and B. The JCV values are largely spread out between 0 and 1.0. The ECDF plot also reflects this by taking on a sigmoidal curve with an inflection at around 0.35.

The three larger putative baramins in this study can be represented by a phylogenetic tree. The 30 *Drosophila* species in figure 3A are broken up into two monobaramins. These two monobaramins correspond to two big subgenera of the genus

*Drosophila*, *Drosophila*, and *Sophophora*. *D. busckii* is the single member of the subgenus *Drosophila*. *D. grimshawi* seems to be misplaced, since this species is a member of the subgenus *Drosophila*. This species has the lowest mean PCC value within *Drosophila*, meaning that it must be an outlier species. *D. grimshawi* is endemic to the Hawaiian islands, and 32–39% of its genome is estimated to be made up of satellite sequences.<sup>14</sup>

The six *Glossina* species form a tight cluster in the top right of the heat map. They have a mean PCC of 0.838, the highest of any predicted cluster. Their Neighbour Joining Tree can be seen in figure 3B. This tree follows the three subgenera: *Glossina* (*Morsitans*, including *G. m. morsitans*, *G. pallidipes*, and *G. austeni*); *Palpalis* (including *G. palpalis*, *G. fuscipes*); and *Fusca* (representing *G. brevipalpis*). Interestingly, the branches of the *Glossina* tree separate based on the difference in GC% (see Supplementary File 1). The *Morsitans* group has a GC% of 34.1%, whereas the *Palpalis* group has a value of 33.6%, and *Fusca* has a value of only 31.2%. Simply the

difference in GC% might cause differences in k-mer frequencies, which lead to differences in k-mer scores, and which in turn lead to differences in CC values between species. *G. brevipalpis* is an outlier, with its low GC%; its genome size is also the smallest at 3.2 Gbp. Based on whole-genome nucleotide alignments of supercontigs and predicted coding sequences, *G. brevipalpis* is the least similar to all other species. It also differs from the other *Glossina* species in that it has the highest proportion of simple repeats and the lowest coverage of transposable elements. It also has on average less than 5,000 protein-coding genes less than the other species.<sup>15</sup> Based on this, it could be that *G. brevipalpis* is the archebaramin of this group.

Figure 3C depicts the Neighbour Joining tree for the *Anopheles* baramin. Within the baramin is a monobaramin made up of the *Anopheles gambiae* complex.<sup>16</sup> The average PCC value for the 22 *Anopheles* species is 0.744, which is much higher than the average value for the 30 *Drosophila* species. This could be due to the higher variation in the base background distribution in *Drosophila* than in *Anopheles*.<sup>17</sup> For the 22 *Anopheles* species the standard deviation is 0.083, whereas for the 30 *Drosophila* species this is 0.152. Compared to *Drosophila*, *Anopheles* genes also have relatively fewer introns.

### Analysis of mitochondrial genomes

The whole mitochondrial genome (mtDNA) sequences of 98 species of *Anopheles*, *Culex*,

**Table 1.** Group statistics for the four clusters discovered by the cutree algorithm from the PCC matrix using the WGKS method. St. dev. = standard deviation.

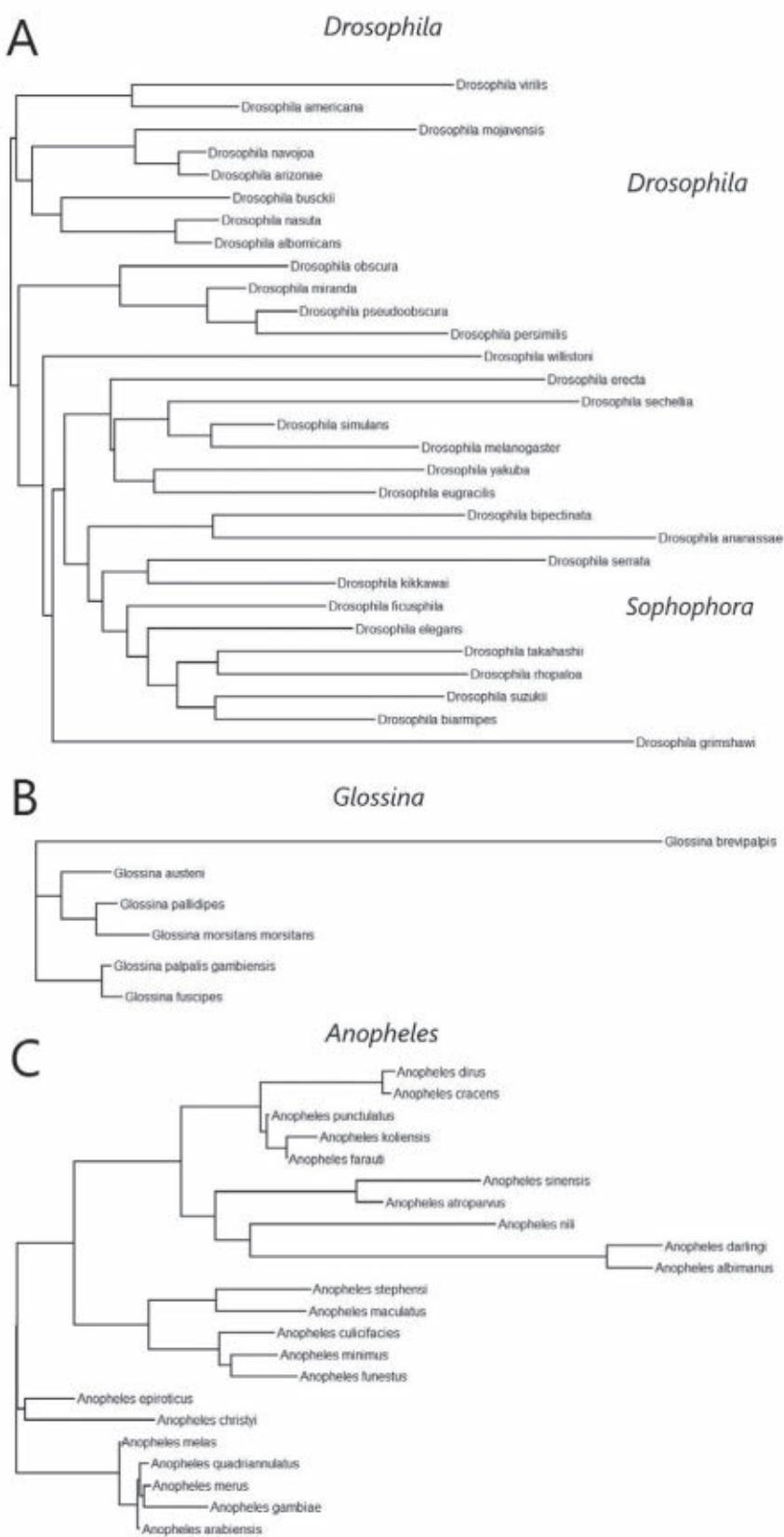
cluster	no. species	min. PCC	mean PCC	max. PCC	PCC st. dev.	p-value
<i>Drosophila</i>	30	0.123	0.452	0.955	0.152	1.08E-36
<i>Anopheles</i>	22	0.556	0.744	0.975	0.083	7.99E-214
<i>Glossina</i>	6	0.671	0.838	0.974	0.114	3.55E-11
<i>Culex+Aedes</i>	3	0.146	0.235	0.399	0.142	0.433

**Table 2.** Average silhouette width for three to five clusters using hierarchical clustering with the eclust R command for all three analyses

k	mtDNA analysis	GCM
3	0.58	0.64
4	0.48	0.58
5	0.49	0.5

**Table 3.** Group statistics for the three clusters discovered by the eclust algorithm from the mtDNA sequence similarity matrix

cluster	no. species	min. sim.	mean sim.	max. sim.	sim. st. dev.	p-value
<i>Drosophila</i>	13	0.864	0.9	0.999	0.03	4.91E-42
<i>Anopheles</i>	65	0.838	0.9	0.996	0.022	0
<i>Culex+Aedes</i>	20	0.880	0.936	0.997	0.033	2.23E-86



**Figure 3.** A. Neighbour Joining tree for the genera *Drosophila*, B. *Anopheles*, C. *Glossina*

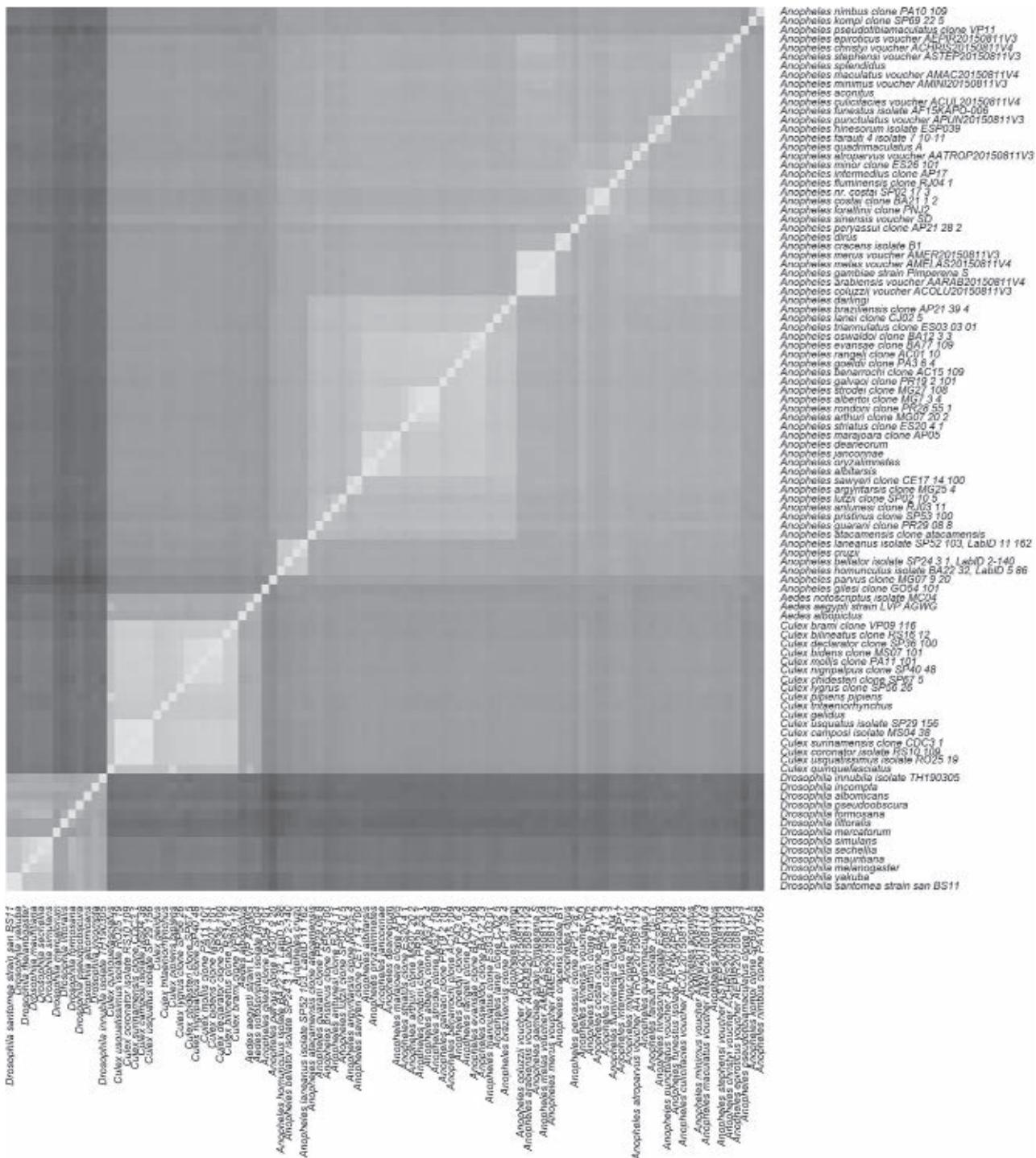
*Drosophila*, and *Glossina*, were analyzed to see if there is any agreement between the mitochondrial DNA and the analysis of the whole genome sequence using the WGKS algorithm. These sequences were aligned with one another using the ggsearch36 algorithm. From this alignment a sequence identity matrix was calculated. The Hopkins clustering statistic was 0.904, which indicates that the similarity matrix is very good for clustering.

The eclust function was run on the mtDNA sequence similarity matrix. The average silhouette width was 0.58 for three clusters (see table 2 and supplementary figure 4). The species list, sequence similarity matrix, clusters, and clustering statistics can be found in Supplementary File 2. Table 3 sums up several statistics for the three groups. On the heat map in figure 4, *Drosophila* and *Culex* both form a separate cluster. Here *Drosophila* and *Anopheles* also both form a separate group, as well as *Aedes*+*Culex*.

This means that both mitochondrial and whole genome results corroborate the same baraminic classification. The beeswarm and ECDF plots can be seen in supplementary figures 5A and B. Since there are more species (98 compared to 58) under consideration, the beeswarm plot is broadened. The ECDF plot has two large and one small hump on it. The similarity values roughly above 0.825 represented by two clumps on the beeswarm plot and two humps on the ECDF plot may correspond to species pairs in the same baramin.

### Application of the GCM algorithm

In order to measure how well the WGKS algorithm classifies individual species, the GCM algorithm<sup>18</sup> was applied on 44 species of *Aedes*, *Anopheles*, *Culex*, *Drosophila*, and *Glossina*. For this, the whole proteomes for these species were downloaded from UniProt database,



**Figure 4.** Heat map showing sequence similarity values between 98 species coming from the alignment of mtDNA whole genome sequences. Lighter shades represent PCC values closer to 1, indicating species from the same baramin. Darker shades represent PCC values closer to 0, indicating species from different baramins.

and run according to the protocol described in O'Micks, 2017. The Hopkins clustering statistic is 0.833, which is very high. Based on the `eclust` function, three clusters were predicted with an average silhouette width of 0.64 (supplementary figure 6). The species used in this analysis

as well as the JCV matrix, the clustering, and the clustering statistics are available in Supplementary File 3. Table 4 sums up several statistics for the three groups.

The JCV values for each pair of species can be seen in the heat map in figure 5. In this figure, we can see that all

mosquitos, *Drosophila* and *Glossina*, all separate well from one another. A larger clump of JCV values can be seen in the beeswarm plot in supplementary figure 7A at a value around 0.67, which corresponds to the large hump on the ECDF plot in figure 6B. Several smaller clumps can be observed above the first clump in the beeswarm plot. These clumps seem to spread out in the beeswarm plot and correspond to a gradual rise in the ECDF plot.

Gene synteny is highly conserved between *Drosophila* species, but it is much weaker between *D. melanogaster* and *A. gambiae*.<sup>19</sup> This indicates the separate baraminic status of these two insect genera. In this analysis *D. busckii* fits well within the *Drosophila* cluster. This could be because the GCM only deals with the presence or absence of genes, and not the gene order. In contrast, the WGKS method analyzes the whole genome sequence, taking all genomic information into account, and is thus a more fine-grained method.

In the JCV matrix, *D. pseudoobscura* had the absolute lowest mean JCV compared to all other species (0.487). In comparison, the average JCV value within *Drosophila* is 0.91. This species also has the smallest number of proteins mapped to orthology groups in the OrthoMCL database. In a comparison between the gene content of *D. melanogaster* and *D. pseudoobscura*, TBLASTN (a program which compares protein sequences against a dynamically translated nucleotide database) discovered 12,179 putative ortholog regions between the two genomes. Of these, only 9,946 genes (81.7%) had a reciprocal best protein hit with a protein from *D. melanogaster*.<sup>15</sup> For this reason *D. pseudoobscura* was removed from the analysis.

Comparative genome analyses show that chromosomal regions do not match up between *Aedes aegypti* and *D. melanogaster*. Instead, synteny is much more highly conserved between *Ae. aegypti* and *A. gambiae*.<sup>20</sup> The JCV between *Ae. aegypti* and *A. albopictus* is 0.799. Between the two *Aedes* species and species from *Anopheles* the mean JCV is 0.692. The mean JCV between the two *Aedes* species and *Drosophila* species is 0.593. The mean JCV between the *Aedes* species and the *Glossina* species is 0.569. This may indicate that *Aedes* could be part of the same baramin as *Anopheles*, as they are both genera from the family Culicidae. This could also possibly mean that mosquitos form a single holobaramin, but this conflicts with results from the WGKS method. Since the GCM only takes the coding regions into

**Table 4.** Group statistics for the three clusters discovered by the eclust algorithm from the JCV matrix using the GCM

cluster	no. species	min. JCV	mean JCV	max. JCV	JCV st. dev.	p-value
<i>Drosophila</i>	15	0.83	0.910	0.978	0.029	5.64E-182
mosquitos	22	0.787	0.819	0.859	0.022	3.97E-23
<i>Glossina</i>	6	0.625	0.782	0.917	0.067	3.24E-94

**Table 5.** Classification of different insect genera based on the three different analyses

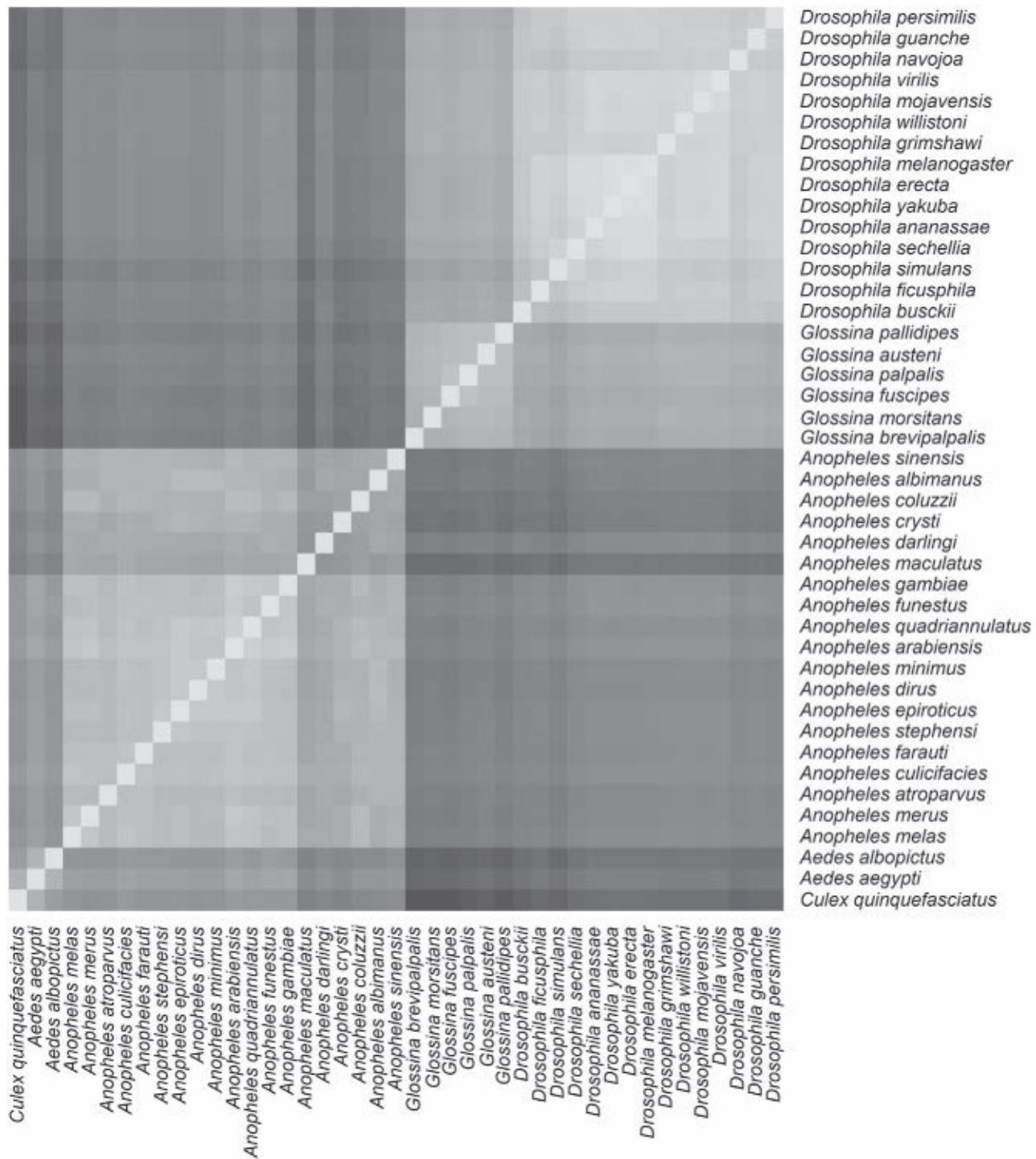
	<i>Aedes</i>	<i>Anopheles</i>	<i>Culex</i>	<i>Drosophila</i>	<i>Glossina</i>
WGKS	C	B	C	A	D
mtDNA	C	B	C	A	-
GCM	C	C	C	A	D

account, the results from the WGKS method might be more accurate.

## Discussion

Comparing evidence from three studies including five genera of Dipteran insects, a new molecular baraminology method can provide us with new insight into the classification of different species into given baramins. Table 5 shows a comparison of the clustering results from the three analyses. The GCM classifies all mosquitos into the same holobaramin, whereas the WGKS method separates *Anopheles* from *Aedes+Culex*. The results from the mtDNA study give the same results as the WGKS algorithm. This could be because both studies analyze whole sequence data, whether it is from the whole genome, or from the mitochondrial genome. Summarizing the results for all three methods, we can say that *Drosophila*, *Glossina*, *Anopheles*, and *Aedes+Culex* belong to separate holobaramins.

Both the mtDNA study and the application of the GCM cover only a small portion (only 1–2%) of the entire genome. The GCM is based on gene content similarity, whereas the mtDNA study is based on overall sequence similarity. Compared to the mtDNA analysis, the WGKS results are based on the correlation of motif content, but in a way which conveys information from the whole genome. Furthermore, it appears that the WGKS algorithm tends to split groups in contrast to algorithms which lump species together (e.g. the GCM).



**Figure 5.** Heat map showing sequence similarity values between 44 species analyzed by the GCM. Lighter shades represent PCC values closer to 1, indicating species from the same baramin. Darker shades represent PCC values closer to 0, indicating species from different baramins.

The PCC values within a given baramin will vary according to the size of the baramin. The more species there are, the larger the variation, and the more diverse the life history of a given baramin, such as *Drosophila*. In contrast, smaller baramins such as *Glossina* have less variation and

a less diverse baramin life history. The background base distribution might also be a factor in species and genome sequence diversity within baramins.

We may speculate that species from the archebaramin have similar genome sequences, made during Creation Week.

Species from the same baramin should generally be able to hybridize with one another. This should be all possible, since during Creation Week there would have been no mutations to obstruct this. One of the main results of the ENCODE project is that more than 80% of the entire human genome is made up of functional units (i.e. enhancers, transcription factor binding sites, repeat elements), which are active in at least one cell type.<sup>12</sup> If two species from the same baramin had a different chromosome number or a very different genome structure, this would not be possible. Many of these elements have a spatial restriction to them, meaning that different genetic elements must line up in a generally linear manner (synteny). For example, enhancer elements may be located very far from one another in the genome, but they have an effect on other genetic elements.

Synteny is widespread and helps understand the life history of a given baramin. Researchers have noted a significant difference in gene order on the X chromosome between *Drosophila* and *Anopheles*.<sup>14</sup> It also happens to be the case that *A. gambiae* has heteromorphic sex chromosomes showing no signs of recombination, whereas *Ae. aegypti* has homomorphic sex chromosomes.<sup>21</sup> This supports the separation of *Anopheles* and *Aedes* species into separate baramins.

The present algorithm is more precise and more rigorous than the GCM. This new molecular baraminology method can be used in addition to existing methods to classify species into baramins.

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# Do lizards and snakes form separate apobaramins?

Matthew Cserhati

Lizards and snakes are both squamate reptiles, meaning they have a unique joint between their jaws as well as scales which they shed in a special manner. Some evolutionists claim that snakes are related to legless lizards, based on superficial morphological similarities. The molecular-based Gene Content Method (GCM) and the morphology-based BDIST methods were combined to analyze a proteomics data set and a morphology data set to determine baraminic relationships. The eight snake and lizard species separated from one another under GCM. Morphological results classified 123 squamate species into 17 baramins (one amphisbaenian, one chameleon, one dibamid, two gecko, two iguana, three lizard, four skink, and three snake baramins), reproducing some results from previous baraminology studies. The present results show that the similarities between snakes and legless lizards are superficial, meaning they are unrelated. Rather, they form their own separate apobaramins.

Lizards (*Lacertilia*) and snakes (*Serpentes*) are both sub-orders of squamates, which are reptiles, with a unique jaw joint, and which shed their scaly skin. These two groups have 4,900 and 3,070 living species, respectively, making them the second largest group of terrestrial vertebrates.<sup>1</sup> Squamates have a large ecological and medicinal importance.

According to one interpretation of the book of Genesis, the serpent was cursed to crawl on its belly and eat the dust of the earth (Genesis 3:15).<sup>2</sup> It is possible that the serpent was originally created with legs. The fact that some snake fossils have been found with reduced limbs corroborates this.<sup>3</sup> Multiple lizard species belonging to several families have also undergone limb reduction, such as some skinks (family *Scincidae*, worm/legless lizards).

The evolution of snakes has been debated for a long time.<sup>4</sup> According to some extreme theories, both snakes and varanid lizards (a family that includes monitor lizards and goannas) originate from limbless marine reptiles, such as mosasaurs.<sup>5</sup> Some evolutionists claim that legless lizards and snakes are related to one another, based on their long, slender bodies and loss of limbs.

Baraminology is the study of the created kinds mentioned in Genesis 1. The focus of baraminology is to determine the created kind, otherwise known as the baramin. A baramin consists of species which are all related to one another, but unrelated to all other species. An apobaramin is a group which consists of at least one baramin, unrelated to all other species.

If we translate this question to baraminology, do lizards and snakes form a single baramin, or separate baramins? In other words, are squamates members of an apobaramin, containing both lizards and snakes? Suborders *Lacertilia* and *Serpentes* are taxa which are higher than the family. In general, baraminologists tend to equate kinds with the family.<sup>6</sup> Therefore, it is possible that there may be multiple lizard and snake baramins, if these two suborders indeed turn out to be separate apobaramins. However, the focus of this

paper is to examine whether these two groups are separate apobaramins. Table 1 lists differences between lizards and snakes.<sup>7</sup>

## General genomic differences

Reptiles are a very diverse group of organisms, when it comes to genome size, chromosome number, presence of microchromosomes, mitochondrial gene arrangement, and sex chromosome configuration. This alone indicates substantial barriers which divide reptiles into separate apobaramins. For example, in snakes, females exhibit heterogamety (i.e. they carry different sex chromosomes, e.g. X and Y in humans), whereas in lizards, either males and/or females show heterogamety, and in some groups, sex determination is temperature dependent.<sup>8</sup>

According to mitochondrial studies, snakes have unusual mitochondrial DNA characteristics, such as translocated, truncated tRNA genes and other shortened genes, as well as a second control region (CR) nested between NADH subunits 1 and 2.<sup>9</sup> Based on an analysis of the protein-coding genes and the rRNA genes of the mtDNA, Jiang *et al.* found that lizards and snakes cluster well away from one another.<sup>10</sup> Castoe *et al.* found similar results based on the analysis of the Cytochrome Oxidase I (COI) subunit.<sup>11</sup>

The ‘venome’ is a term used to describe the repertoire of venom proteins secreted by both lizards and snakes. Transcript studies show that nine types of toxins are shared by both lizards and snakes. These venom proteins are normal proteins, but which adversely affect the physiology of its victim when injected into the bloodstream, as any foreign protein would. Iguanian lizards have venom-secreting glands on both their upper and lower jaws, whereas snakes and anguimorph lizards have lost either their mandibular or maxillary venom glands.<sup>12</sup>

Interestingly, the front-fanged venom system (where the fangs are placed anteriorly in the upper jaw)<sup>13</sup> is known to

**Table 1.** Main morphological differences between lizards and snakes

Characteristic	Snakes	Lizards
Diet	carnivores	carnivores, herbivores, omnivores
Eyelids	no eyelids	eyelids present
Jaw	flexible	immobile
Locomotion	gliding on bottom scales	twisting body and legs
Nictitating membrane	absent	present
Sensory organs	heat pits (many species); no ears	external ears
Tails	short, do not break off	long, can break off
Teeth	fangs (sometimes hollow)	flat teeth

**Table 2.** List of species used in the GCM analysis

Species	Suborder	Family	Refseq proteins	OrthoMCL hits
<i>Anolis carolinensis</i>	Lacertilia	Dactyloidae	34,816	32,159
<i>Gekko japonicus</i>	Lacertilia	Gekkonidae	24,474	23,146
<i>Pogona vitticeps</i>	Lacertilia	Agamidae	38,725	36,268
<i>Notechis scutatus</i>	Serpentes	Elapidae	31,232	29,149
<i>Protobothrops mucrosquamatus</i>	Serpentes	Viperidae	23,352	22,005
<i>Pseudonaja textilis</i>	Serpentes	Elapidae	31,677	29,643
<i>Python bivittatus</i>	Serpentes	Pythonidae	32,724	30,695
<i>Thamnophis sirtalis</i>	Serpentes	Colubridae	25,180	23,386
<i>Chelonia mydas</i> (control)	Testudines	Cheloniidae	28,672	27,103

**Table 3.** Results of kmeans clustering based on results from the GCM algorithm

Baramin	Species	Mean JCV	st. dev.	min JCV	max JCV	p-value
Serpentes	5	0.758	0.054	0.683	0.874	0.023
Lacertilia	3	0.731	0.028	0.702	0.758	0.318

be present in three snake groups: viperids (rattlesnakes and vipers), atractaspidines (burrowing asps), and elapids (a large group of snakes that includes cobras and sea snakes).<sup>1</sup>

#### Previous baraminology studies

Hennigan estimated that there are 41 snake kinds belonging to three families, Boidae (boas), Colubridae (the largest snake family, with 249 genera and approximately 1,700 species),

and Viperidae.<sup>14,15</sup> Frankhauser and Cumming also found evidence of extensive hybridization within the Colubridae, so the number of baramins in this group is currently indeterminate.<sup>16</sup> Wood performed BDIST analysis on the gecko family Pygopodidae, separating two baramins from one another, the two genera *Aprasia* and *Delma*.<sup>17</sup> This indicates that there could be multiple gecko baramins.

#### Principle of analysis

It would be helpful to use molecular baraminology approaches to quantify the differences between lizards and snakes and attempt to identify their baraminic status. For example, there may be important physiological and genomic differences between lizards and snakes which are not visible phenotypically.

The Gene Content Method (GCM)<sup>18</sup> was applied to the whole proteomes of three lizard species and five snake species. The green sea turtle (*Chelonia mydas*) was used as a control. These species are listed in table 2.

A morphology-based baraminology analysis was also performed using an expanded data set containing 192 species and 691 characters assembled by Reeder *et al.*<sup>19</sup> This data set contained species of lizards, snakes, and amphisbaenians, a group of squamates containing species with slender bodies and loss of legs and eyes.

#### Materials and methods

All supplementary data and figures are available along with a description file on github at [github.com/csmatyi/squamates](https://github.com/csmatyi/squamates).

The Refseq proteins of three lizard species, five snake species, and *C. mydas* were downloaded from the NCBI Protein database. These proteomes were run using the OrthoMCL algorithm using default parameters at the Globus Genomics website.<sup>20</sup>

Data analysis and heat map generation were performed in R (version 3.6.0). K-means clustering was used to partition the species into clusters using the k-means command in R, after setting the algorithm parameter to ‘Forgy’. The

Forgy algorithm is a widely used k-means clustering algorithm, which classifies entities based on their minimal distance to k previously determined centroids, each of which represents one of the k clusters. The centroids can be determined by selecting those k entities which are the farthest from one another. In each iterative step, entities are assigned to one of the k centroids, after which the centroids are recalculated.<sup>21</sup> To determine the optimal number of clusters, the ‘cluster’ and ‘factoextra’ libraries and the fviz\_nbclust command were used, after setting the method parameter to ‘wss’ (weighted sum statistic). Heat maps were constructed using the ‘heatmap’ command, using the ‘average’ clustering method.

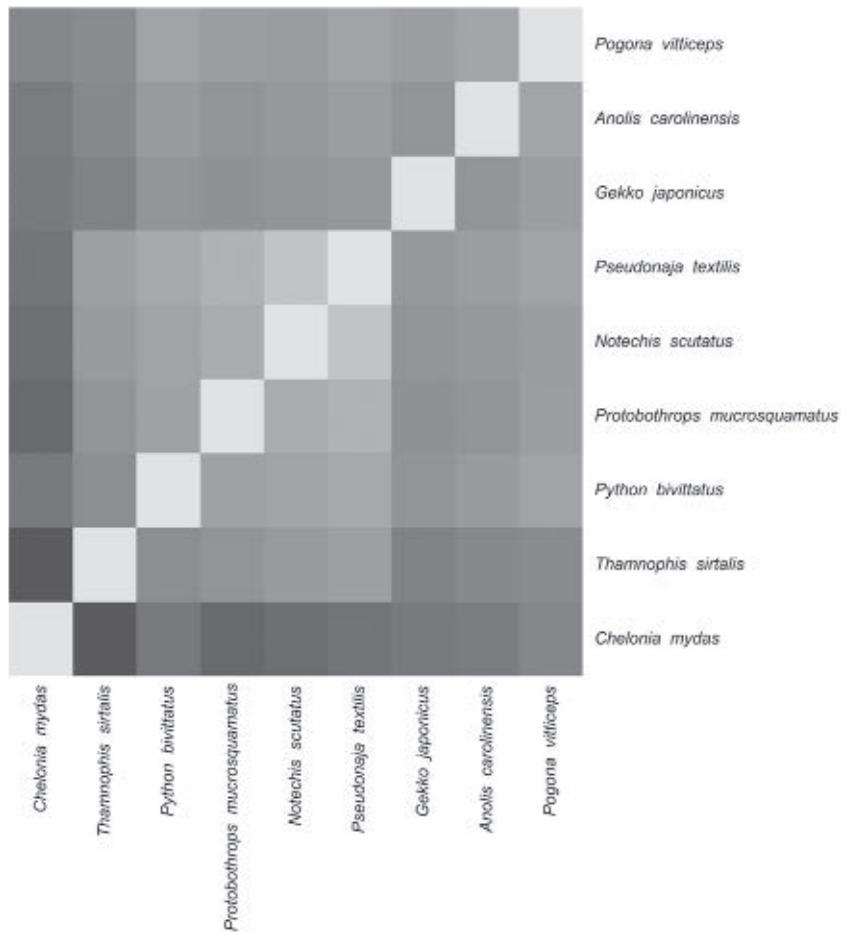
The Reeves data set was downloaded from the Dryad website at datadryad.org/stash/dataset/doi:10.5061/dryad.38417. The data set was filtered using the EntropyFilter.R script at github.com/csmatyi/EntropyFilter.<sup>22</sup> The BDIST software version 2.0 was then run on the reduced data set to determine baraminic relationships at coresci.org/bdist.html.<sup>23–25</sup> BDIST was run using a character relevance cutoff of 0.95. The *cutree* command was used in R to determine baraminic membership in the reduced version of this dataset. Baraminic relationships were visualized with the KiNG (Kinemage, Next Generation) software (64-bit Windows version) available at kinemage.biochem.duke.edu/software/king.php.<sup>26</sup> The KiNG file (Cserhati\_Reeves\_reduced\_squamates\_king.txt) is also available online at the github address.

## Results and discussion

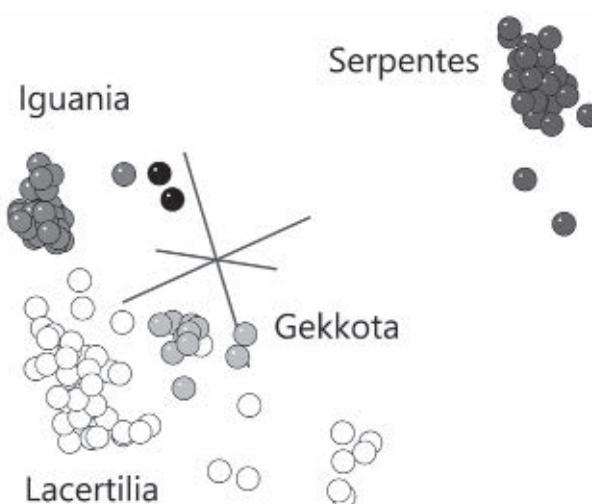
### Biblical analysis

Leviticus 11:29–30 mentions several kinds of lizards:

“And these are unclean to you among the swarming things that swarm on the ground: the mole rat, the mouse, the great lizard of any kind, the gecko, the monitor lizard, the lizard, the sand lizard, and the chameleon.” (ESV)



**Figure 1.** Heat map depicting JCV values between the nine species in the GCM analysis. Lighter shades represent higher JCV values, close to 1 (higher similarity). Darker shades represent lower JCV values, close to 0 (dissimilarity).



**Figure 2.** 3D MDS plot depicting the baraminic relationships between the 123 species coming from the reduced Reeves data set. Four baramins can be seen: Gekkota (light grey), Iguania (medium grey), Lacertilia (white), and Serpentes (dark grey). Two species in black belong to other squamate groups (*Chamaeleo laevigatus* and *Sphenodon punctatus*).

Based on these verses we can suspect that lizards and snakes do indeed belong to different kinds, especially if there are several kinds of lizards, some here even mentioned by name, for example the gecko and the chameleon.

#### Application of the GCM algorithm

The GCM algorithm was run on the whole proteomes of the nine species included in this study. A Jaccard Coefficient Value (JCV) matrix was derived showing the JCV values for

**Table 4.** Clustering of the nine species using kmeans clustering, based on GCM results

Species	Cluster
<i>Anolis carolinensis</i>	2
<i>Chelonia mydas</i>	outlier
<i>Gekko japonicus</i>	2
<i>Notechis scutatus</i>	1
<i>Pogona vitticeps</i>	2
<i>Protobothrops mucrosquamatus</i>	1
<i>Pseudonaja textilis</i>	1
<i>Python bivittatus</i>	1
<i>Thamnophis sirtalis</i>	1

**Table 5.** Baramin statistics for 14 of the 17 predicted baramins from the reduced Reeves data set. Only those baramins are shown which have at least three species.

Baramin	Species	mean	stdev	min	max	p-value
1	3	0.174	0.028	0.149	0.204	0.005
2	10	0.1	0.019	0.048	0.128	9.01E-142
3	16	0.09	0.028	0.014	0.136	0
4	6	0.099	0.032	0.055	0.162	4.72E-20
5	8	0.077	0.02	0.045	0.124	6.56E-80
8	27	0.082	0.019	0.031	0.145	0
9	13	0.124	0.036	0.038	0.198	1.02E-137
10	4	0.072	0.014	0.048	0.089	1.92E-20
11	4	0.121	0.056	0.01	0.156	5.87E-05
12	3	0.204	0.109	0.079	0.276	0.104
13	10	0.152	0.042	0.024	0.223	7.79E-37
14	4	0.103	0.029	0.056	0.133	1.13E-07
15	3	0.097	0.034	0.059	0.125	0.0035
17	6	0.128	0.047	0.007	0.175	4.73E-12

all possible species pairs (figure 1). The JCV value determines the ratio of common ortholog groups divided by the union of all ortholog groups between two species. Values closer to 1 correspond to species more likely to belong to the same baramin. Values closer to 0 correspond to species which likely belong to separate baramins. The JCV matrix is available online at the provided github address (supplementary file 1).

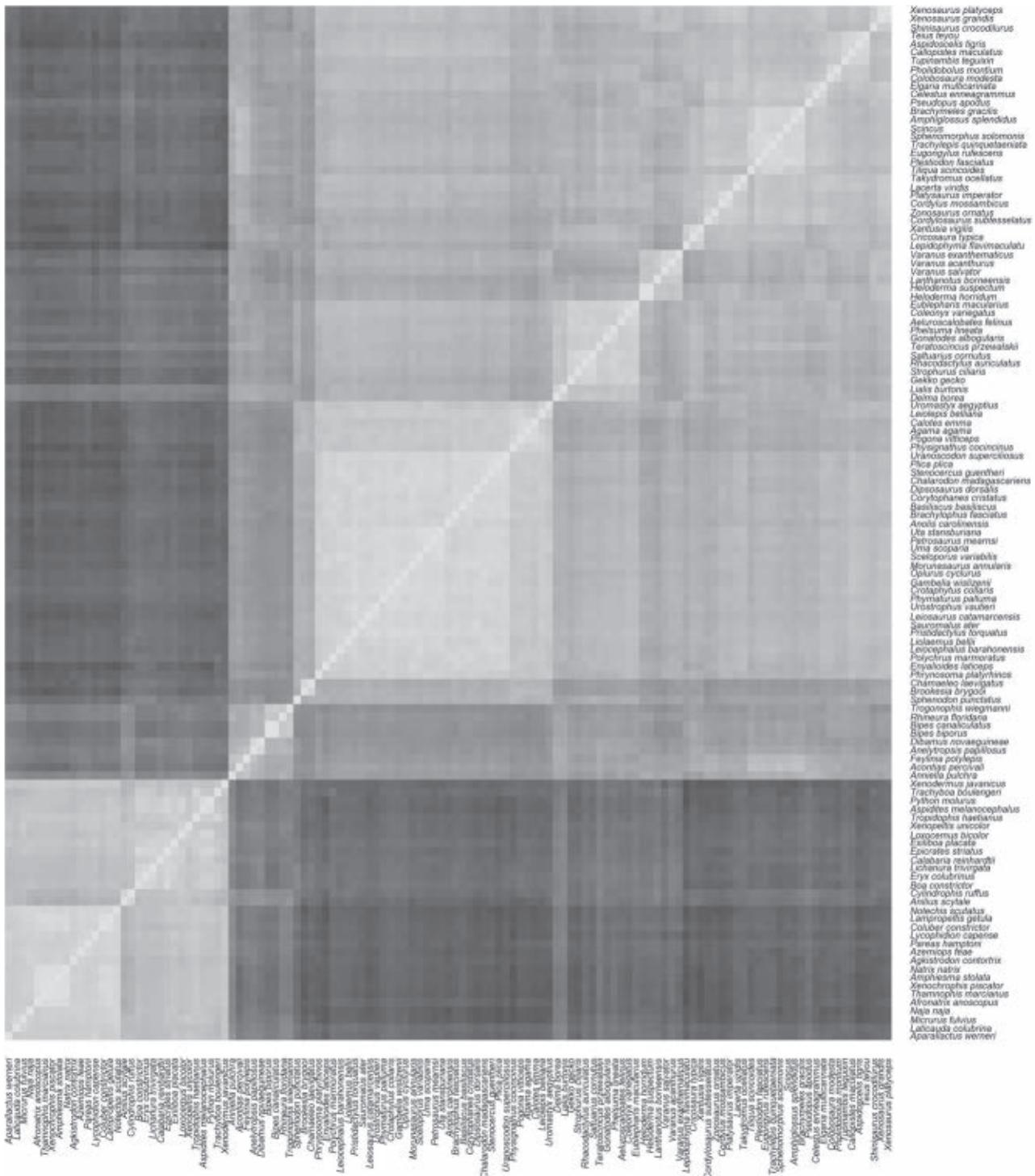
Pre-clustering analysis was performed on the JCV data set. The Hopkins statistic is relatively low (0.595), meaning it is still usable for clustering even though values greater than 0.75 are preferable. In supplementary figure 1, we can see that the optimal cluster number is 4 (as defined by the wss method used by the `fviz_nbclust` command in R). This suggests that lizards and snakes belong to separate apobaramins. If lizards and snakes belong to the same apobaramin, then the optimal cluster number would be 2 (cluster 1 = the outlier, cluster 2 = lizards + snakes).

Figure 1 shows the main result from the GCM algorithm. Tables 3 and 4 show the result of the k-means clustering, along with descriptive statistics. The five snake species cluster well together in the heat map. They also separate well from *C. mydas*, the outlier species, and the three lizard species. The snake cluster has a p-value of 2.3%, meaning that it is a statistically significant cluster. However, the other cluster, which includes the three lizard species, has a very high p-value > 5% (31.8%). The reason for the poor clustering of lizards could be because the three species which were sampled could possibly belong to separate baramins. Inclusion of more species could clarify whether there are one or more lizard kinds.

Morphological analysis of squamates using the BDIST algorithm

In order to get a more complete picture of the baraminic relationships between different squamate groups, a morphological analysis of a data set of 192 squamate species including lizards, snakes, and amphisbaenians was used, with 691 morphological characters. The species and character values in this data set are available online at github (supplementary file 2).

Since 33.5% of the character values in the data were undetermined (?), data filtering was done using the Entropy Filtering method as described in the Materials and Methods section. The maximum proportion of unknown values per species and per column were both set to 40%, with a minimum entropy value of 10%. After filtering, 5.5% of the characters remained undetermined,



**Figure 3.** Heat map depicting JCV values between the 123 species coming from the entropy filtered data set in the morphology analysis. Lighter shades represent higher JCV values, close to 1 (higher similarity). Darker shades represent lower JCV values, close to 0 (dissimilarity).

leaving 123 species and 409 characters. Data reduction was 2.6-fold.

The BDIST software was run on the reduced data set, with a character relevance cutoff of 0.95. The resulting BDC matrix shows two large groups showing statistically

significant continuity within them, and significant discontinuity between them. Snakes separate well from all other squamates used in the data set (supplementary figure 2). A stress plot shows a minimal unscaled stress value of 0.026 at 17 dimensions (supplementary figure 3).

A 3D MDS plot was drawn for the 123 species, which can be seen in figure 2. Four larger groups can be seen in different shades. Serpentes separates well away from all the other species. Gekkota (geckos) and Iguania (iguanas) both form a small group next to a larger cluster, Lacertilia (lizards).

The distance matrix coming from the BDIST analysis was transformed into a proximity matrix by subtracting the distance values from 1 to reflect the proximity of each species to each other. The Hopkins statistic was 0.916, particularly high, meaning that the data set can be clustered very well. An Elbow plot made with the proximity matrix shows that the optimal number of clusters in the data set is four (supplementary figure 4).

A heat map was made from the proximity matrix (figure 3). Here also snakes (lower left) quite visibly separate from all other squamates (upper right). According to the stress plot, the minimum unscaled stress was shown for 17 baramins. Fourteen of the 17 predicted baramins had at least three members. Of these 14, 13 are statistically significant ( $p$ -value  $< 5\%$ ). Classification of species into clusters is described more fully in supplementary file 2 online. The statistics for these predicted baramins can be seen in table 5.

These groups correspond to one amphisbaenian baramin, one chameleon, one dibamid, two gecko, two iguana, three lizard, four skink, and three snake baramins. Among the lizard baramins we have an anguimorph and a varanus baramin, consisting of the family Lacertidae. Interestingly, the baraminic classification of Wood was also partially reproduced, putting the two gecko species *Delma borea* and *Lialis burtonis* into the same baramin (cluster #16).

## Conclusion

These results are in harmony with previous squamate baraminology studies. The present studies provide further molecular proof that snakes form a well-defined group separate from all other reptiles. Despite superficial resemblance between snakes and legless lizards, snakes and lizards are apparently unrelated. Thus, snakes and lizards can be comfortably classified into their own separate apobaramins. Multiple snake and lizard baramins also indicate that, as opposed to humans, God could have created several baramins which closely resemble one another (i.e. multiple snake ‘kinds’), but further studies are required to work out their exact relationships.

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# Psalm 104:6–9 likely refers to Noah's Flood

William Barrick, Michael J. Oard and Paul Price

A majority of church scholars and some young-earth creationists believe that Psalm 104:6–9 refers to the third day of creation, despite the straightforward reading of the verses indicating the Flood. A deeper analysis of the verses along with the usage of certain words and phrases in the rest of Scripture suggests that Psalm 104:6–9 refers to the Flood and not to creation. The psalm is likely not a creation psalm as only three out of 12 phrases in the first five verses refer to the creation. The proof texts, Job 38:4–11, Proverbs 8:22–31, and Jeremiah 5:22, used to support a creation interpretation are analyzed and shown to be equivocal. Besides being within the context of the Flood, verse 8 likely refers to tectonic forces of mountains rising and valleys sinking, as translated in the ESV and NASB. The linguistic arguments brought forth to support creation from verse 8 are shown to be either equivocal or support the Flood. Geology and geophysics are also consistent with Psalm 104:8 referring to the tectonics of the Flood.

The meaning of Psalm 104:6–9 is controversial. The majority of scholars in the church at large believe that these verses are referring to the creation, where on Day 3, God caused the dry land to appear amidst the waters below that were gathered into one place.<sup>1</sup> This may be because most church scholars do not even believe that Genesis 6–9 refers to a global flood. For instance, Davis Young, a retired Professor of Geology from Calvin College, believes in a local flood and that Psalm 104:6–9 refers to the creation.<sup>2</sup> He accepts secular geology, including uniformitarianism, deep time, and evolution. So, it is not surprising that he cannot see any evidence whatsoever for a global flood: "... there is no geological evidence to confirm the idea of a universal deluge."<sup>3</sup> This is exactly why most Psalms commentaries fail to even mention the Flood in their treatment of Psalm 104—they do not look for something in the text that they believe never happened to begin with. An example of this type of influence on interpreting Psalm 104 shows up with Kidner's two commentaries on Genesis and Psalms. He speaks of the Flood as causing limited destruction and being "a mere token of judgment"<sup>4</sup> in Genesis. In addition, he argues that the language of Genesis 7:19–24 does not eliminate the possibility of the Flood being merely a localized event—the wording of the text is merely the language of appearance.<sup>5</sup> With regard to mountains and the Flood in the Genesis account, Kidner says:

"It should perhaps be added that some of the writers who consider the flood to have been global conjecture that in the pre-diluvian world the main mountain ranges had not yet been thrust up (see, e.g. Whitcomb and Morris, *The Genesis Flood*, pp. 267ff.)."<sup>5</sup>

Thus, in his commentary on Psalm 104, Kidner does not even mention the Flood. Interestingly, however, he does understand verse 8 to refer to the rising of mountains and the depression of ocean basins, but at creation:

"The vivid rhetoric of verses 7 and 9 finely dramatizes the rise of continents and the formation of ocean depths which their companion verse 8 presents in more sober terms."<sup>6</sup>

In other words, commentators who have already made up their mind that Genesis 6–9 refers to a local flood, have no reason whatsoever to even consider the Flood as a topic in Psalm 104 with the globality of what the psalmist describes. We must, therefore, understand that the relative absence of the Flood as an interpretation in most Psalms commentaries merely reflects their rejection of the global language of the Genesis Flood account. God reminds us throughout His Word not to accept the wisdom of man, which is foolishness to God (1 Corinthians 1:3). The secular beliefs upon which they depend reflect mere human wisdom attempting to explain the origin of everything without God—as well as their reliance on uniformitarianism to explain away the global catastrophe of the Flood.

A word of caution must be given here—an interpreter can take Genesis 6–9 as referring to a literal global Flood and yet interpret Psalm 104 as solely a reference to creation.<sup>7</sup> Still, others have argued that Psalm 104:6–9 refers to the Flood.<sup>1,8,9</sup> If so, then it may provide relevant information for understanding the geotectonics of the Flood that Flood models would need to take into account. So, does Psalm 104:6–9 refer to Creation Week or Noah's Flood?

## Psalm 104:1–10

We will first quote Psalm 104:6–9<sup>10</sup> in its context with the verses before and the verse after:

<sup>1</sup>"Bless the LORD, O my soul!

O LORD my God, you are very great!

You are clothed with splendor and majesty,

<sup>2</sup>covering yourself with light as with a garment,

stretching out the heavens like a tent.  
<sup>3</sup>He lays the beams of his chambers on the waters; he makes the clouds his chariot he rides on the wings of the wind;  
<sup>4</sup>he makes his messengers winds, his ministers a flaming fire.  
<sup>5</sup>He set the earth on its foundations, so that it should never be moved.  
<sup>6</sup>“You [God] covered it [the Earth] with the deep as with a garment; the waters stood above the mountains.  
<sup>7</sup>At your rebuke they [the waters] fled; at the sound of your thunder they took to flight.  
<sup>8</sup>*The mountains rose; the valleys sank down* to the place that you appointed for them.  
<sup>9</sup>You set a boundary that they [the waters] may not pass, so that they might not again cover the earth.  
<sup>10</sup>You make springs gush forth in the valleys; they flow between the hills; [brackets and emphasis added].”

### Straightforward indications Psalm 104:6–9 refers to the Flood

Psalm 104:1–5 provides the context upon which verses 6–9 build. Verse 1 opens the psalm with praise for the greatness, the majesty, and the splendour of the LORD God. Verses 2–4 focus primarily on how certain aspects of creation accompany the Creator and demonstrate His control over all things. It is at verse 5 that readers see the psalmist’s emphasis switching to the earth and those who inhabit it. Psalm 104:5b (“so that it should never be moved”) presents a theme occurring in contexts like Psalms 93:1; 96:10; and 1 Chronicles 16:30 (this final text seems to be quoting Psalm 96), which all speak of the Lord’s sovereign rule over the earth. In such texts the seas also appear (Psalms 93:3–4; 96:11; 1 Chronicles 16:32). The psalmist’s primary concern in Psalm 104:1–5 consists of meditating on the sovereign God’s control over all creation at all times—from creation up to the psalmist’s own day. We suggest the psalmist develops his theology from an orderly reference to the events under God’s control as described in Genesis 1–9. Those early biblical chapters testify to His mighty deeds and continuing control over creation—even through the Flood. The psalmist speaks of the past relative to his own time. For example, Psalm 104:32 refers to volcanic activity predating the psalmist but occurring in the post-Flood world.

At first reading, Psalm 104:6–9 seems to refer to the Flood.<sup>11</sup> Psalm 104:6 states that God “covered” the earth, including the mountains. The language in Genesis 1 is quite different. Genesis 1:2 states: “The earth was without form and void, and darkness was over the face of the deep. And

the Spirit of God was hovering over the face of the waters.” Genesis 1:6 does not speak of the waters covering anything: “And God said, ‘Let there be an expanse in the midst of the waters, and let it separate the waters from the waters.’” Then, Genesis 1:9 speaks of *uncovering* land on Day 3 of creation—and no mention of mountains: “And God said, ‘Let the waters under the heavens be gathered together into one place, and let the dry land appear.’ And it was so.” Not until we reach the Flood account in Genesis 7:19 do we read, “The water prevailed so mightily on the earth that all the high mountains under the whole heaven were *covered*” (emphasis ours). The same Hebrew word for “cover” also was used for when the Red Sea covered the Egyptians.<sup>12</sup> Psalm 104:9 repeats the word “cover” emphasizing again that the psalmist refers to the Flood and not to Day 3. Those who believe Psalm 104 refers to the creation point out that these Flood indications are equivocal. They believe God covered the earth in water on Day 1, so that Day 3 would represent an ‘uncovering’, which could include uncovering pre-existing underwater mountains. However, the text in Genesis does not specify any mountains whereas Psalm 104:6 directly states that the mountains were covered in the event to which the psalmist refers (just as Genesis 7:19 also states). Dry land did not “appear” until Day 3, and the text does not indicate whether any land or mountains were beneath the waters on Day 1. Such specificity might argue more effectively for the Flood as a reference.

In verse 9, God set a boundary that the water would not return “again to cover the earth”. He gave the rainbow as His promise that He had fixed the boundary perpetually. The Old Testament refers specifically to God setting boundaries only in this verse and in Joshua 22:25 and Jeremiah 5:22. In Joshua, however, the writer used the Hebrew verb *nathan* (“set”), whereas Psalm 104:9 uses the Hebrew *sim* (“set”). In Joshua, the waters of the Jordan River comprise the boundary, but in Psalm 104 a boundary is set *for* the waters of the seas. Only two other biblical texts use the Hebrew verb *sim* (“set”) for setting a “boundary” (*gevul*): Isaiah 54:12 and Jeremiah 5:22. Isaiah reveals God’s promise to protect His people by setting a “boundary” around them. He compares this promise to God’s promise to never destroy the earth by water again: “This is like the days of Noah to me: as I swore that the waters of Noah should no more go over the earth, so I have sworn that I will not be angry with you, and will not rebuke you.” In his commentary on this text, Grogan ties the mention of the Noahic Flood (Isaiah 54:8) to the mention of mountains (v. 9): “Illustrating his theme from both history and nature, the prophet compares God’s oath to the great postdiluvial promise of Genesis 8:22, which itself related to the natural environment of man and so suggested the reference to the mountains.”<sup>13</sup> Grogan’s point involves the protection of humanity’s natural environment to enable them to carry on with life—a similar theme to what Psalm

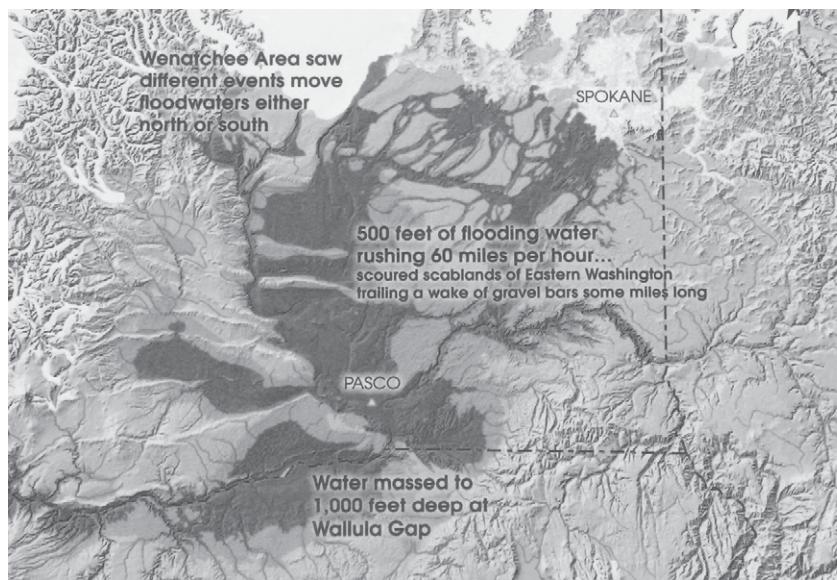
104 depicts. We cannot ignore these verbal similarities. Isaiah and the anonymous psalmist chose their particular wordings with care and with a view to the biblical event of the Flood to which they each were alluding. Jeremiah 5:22 presents a more compelling case by using the same verb “set” (*sim*) and the same noun “boundary” (*gevul*). God says, “I placed the sand as the boundary for the sea, a perpetual barrier that it cannot pass; though the waves toss, they cannot prevail; though they roar, they cannot pass over it.” The readers of Jeremiah would understand this as a reference to their experience in the present post-Flood world rather than being about creation. In addition, “prevail” (*yakul*) is the semantic equivalent of “prevailed” (*gavar*) in Genesis 7:19, but a synonym more commonly employed for the concept in post-exilic Hebrew literature (see the same verb in Jeremiah 1:19; 15:20).

When “rebuke” (Psalm 104:7a) occurs in Hebrew poetry (as a noun or a verb) with water as the object, the meaning has nothing to do with either judgmental or insulting speech. In Isaiah 17:10–14 the prophet compares the nations around Israel to roaring waters threatening to sweep Israel away. His message to Israel points to the fact that the Lord will *protect* His people. “Rebuke” in that context refers to turning the nations back and nullifying their destructive power. Thus, metaphorically, the raging waters picturing the threatening nations will “flee” (*nus*, the same verb used in Psalm 104:7). God, as the Creator, can command the sea to dry up, cause the vegetation of the mountains to dry up, and make the mountains quake (Nahum 1:4–5). Therefore, no one should doubt that He can bring judgment upon the unrighteous anytime He chooses to do so (just as He did in Noah’s day). The psalmist declares that God “rebuked” the waters of the Red (Reed) Sea so that Israel might leave Egypt walking on dry ground (Psalm 106:9). “Rebuke” is nothing more than a figurative way of saying “turn back” or “remove,” when it is used of what the Almighty God does to protect His people from either literal water or dangerous peoples depicted by raging waters. “Rebuke” occurs in reference to protection and deliverance from danger—as in the case of the psalmist in Psalm 18:15 (same as 2 Samuel 22:16; see also Isaiah 50:2). Such language does not fit creation, because the Holy Spirit was already protecting the waters before there were any landforms. Also, when the dry land appeared on Day 3, there’s no indication that the land needed deliverance from danger. However,

since water had destroyed the world of Noah’s time (2 Peter 3:6), the post-Flood world does need divine protection. God provided assurance that He would never again destroy the world with a flood by His promise in Genesis 9:11–17 and His assigning the rainbow as the sign of that promise.

### Is Psalm 104 a creation psalm?

Although elements of the creation occur in Psalm 104, the psalm does not seem to be strictly a creation psalm. Psalms scholars tend to classify Psalm 104 as a hymn of celebration or remembrance of the Lord’s deeds and character.<sup>14</sup> Such hymns may refer to creation, but are not limited to that particular divine deed. The first five verses only partly refer to the creation from Genesis 1 while praising God for His greatness. Only three out of 12 phrases in the first five verses refer to the creation. Verses 10 to 35 seem to apply to the post-Flood world, especially since the cedars of Lebanon are mentioned in verse 16b. In other words, the psalmist’s meditation moves from creation to the Flood to the post-Flood. In all three eras he sees the glory of God in what He has done and what He is doing. Psalms 105 and 106 also present a chronology of history in regard to Israel as hymns of celebration and remembrance—and, the psalmist(s) certainly includes his(their) own time(s) as being impacted by earlier events. An argument could be made that Psalms 104–106 comprise a chronological trilogy describing Yahweh’s deeds for which His people should praise Him. W.A. VanGemeren identifies a common motif in these three psalms dealing with “God’s fidelity as Creator-Ruler and as the Redeemer of his people.”<sup>15</sup> Therefore, Psalm 104 should be considered part of



**Figure 1.** A satellite picture of eastern Washington showing the erosional path of the Lake Missoula Flood (Landsat image courtesy of NASA). The flood eroded the light-coloured silt and exposed the black basalt, which shows up like a braided stream bed, but it is about 160 km (100 miles) wide.

a trilogy of historical psalms focused on the sovereign God's works from creation through Redemption.

Thus, the psalm is a praise for God's greatness, power, and providence over His creation throughout history, which opens up the possibility that more than the six-day creation is described in the psalm. The Flood and its aftermath can be included in such a psalm. Barrick believes the psalm to be divided into three parts: the creation, the Flood, and the post-Flood period:

"Psalm 104 does not limit itself to creation. The psalmist writes of three major eras in earth history: creation (vv. 1–5), Flood (vv. 6–9), and post-Flood (vv. 10–35). Proponents of creation as the event involved in these verses tend to ignore the details of the Hebrew text or to come under the influence of uniformitarian preconceptions or to reveal an over-emphasis on pagan myths depicting creation as a battle between God and chaos."<sup>16</sup>

### **Reasons why some young-earth creationists believe Psalm 104:6–9 refers to the creation**

Although many young-earth creationists believe that Psalm 104:6–9 refers to the Flood, some do not. Rick Lanser of the Associates for Biblical Research is one such example.<sup>17</sup> He bases his thesis on 'proof texts' in Job 38:10, Proverbs 8:29, and Jeremiah 5:22 and therefore claims Psalm 104 is a creation psalm. But Lanser also has several anomalous views of the Flood. Unfortunately, he displays ignorance of Flood geology by positing a tranquil flood and continental split *after* the Flood related to the time of Peleg (Genesis 10:25). However, a global flood could not be tranquil. Such a flood would be highly erosive. The Lake Missoula flood (figure 1) eroded 128 km<sup>3</sup> of hard basalt and soft silt in eastern Washington.<sup>18</sup> Moreover, the context of Genesis 10 and 11 is the "dividing up" of the land and the spreading of people groups all over the earth. So, it is likely that the division in Peleg's time is referring to the Babel dispersion.

Andrew Kulikovsky also believes Psalm 104:6–9 refers to the creation mainly for linguistic reasons:

"But only Psalm 104:2–9 specifically refers to creation events. ... Numerous young earth creationists have appealed to the translation of Psalm 104:8 in the NASB as biblical support for the idea that the catastrophic flooding caused the mountains to rise and the valleys to sink: 'The mountains rose; the valleys sank down to the place which thou didst establish for them.' However, the grammar and context of this verse strongly mitigate against this translation. ... Nevertheless, it is still highly likely that the flood did in fact cause the mountains to rise and the valleys to sink ..."<sup>19</sup>

He gives two reasons for his belief, which will be discussed below.

### **An analysis of the scriptural proof texts**

Lanser brings up several proof texts from the Bible, namely Job 38:4–11, Proverbs 8:22–31, and Jeremiah 5:22, believing that these verses should interpret Psalm 104:6–9. Therefore, he believes that because these verses refer to a boundary set on the oceans at creation, the boundary set in Psalm 104:9 must also refer to the creation.

In Job 38, God begins asking Job questions. Job 38:4–11 states in referring to the creation:

<sup>4</sup> "Where were you when I laid the foundation of the earth?

Tell me, if you have understanding.

<sup>5</sup> Who determines its measurements—surely you know!

or who stretched the line upon it?

<sup>6</sup> On what were its bases sunk,  
or who laid its cornerstone,

<sup>7</sup> when the morning stars sang together  
and all the sons of God shouted for joy?

<sup>8</sup> Or who shut in the sea with doors  
when it burst out from the womb,

<sup>9</sup> when I made clouds its garment  
and thick darkness its swaddling band,

<sup>10</sup> and prescribed limits for it  
and set bars and doors,

<sup>11</sup> and said, 'Thus far shall you come, and no farther,  
and here shall your proud waves be stayed'?"

Proverbs 8:22–31 states, in personifying wisdom about the creation:

<sup>22</sup> "The LORD possessed me at the beginning of his work,  
the first of his acts of old.

<sup>23</sup> Ages ago I was set up,  
at the first, before the beginning of the earth.

<sup>24</sup> When there were no depths I was brought forth,  
when there were no springs abounding with water.

<sup>25</sup> Before the mountains had been shaped,  
before the hills, I was brought forth,

<sup>26</sup> before he had made the earth with its fields,  
or the first of the dust of the world.

<sup>27</sup> When he established the heavens, I was there;  
when he drew a circle on the face of the deep,

<sup>28</sup> when he made firm the skies above,  
when he established the fountains of the deep,

<sup>29</sup> when he assigned to the sea its limit, so that the waters might not transgress his command,

when he marked out the foundations of the earth,

<sup>30</sup> then I was beside him, like a master workman,  
and I was daily his delight, rejoicing before him

always,  
<sup>31</sup> rejoicing in his inhabited world  
 and delighting in the children of man.”  
 Jeremiah 5:22 states:

“Do you not fear me? declares the LORD. Do you not tremble before me? I placed the sand as the boundary for the sea, a perpetual barrier that it cannot pass; though the waves toss, they cannot prevail; though they roar, they cannot pass over it.”

Lanser states in reference to this verse:

“In Jeremiah 5:22 God further states, ‘For I have placed the sand as a boundary for the sea, an eternal decree, so it cannot cross over it.’ ‘An eternal decree’ is mighty strong language; it testifies to an original land/sea boundary that the Flood event could not change!”<sup>17</sup>

The aforementioned proof texts mostly revolve around the “boundary” that God set in Psalm 104:9 so that the water may not cross. Job 38:10–11 and Proverbs 8:29 likely refer to the *general* rule of the sea set at creation. See our previous discussion of Jeremiah 5:22 for its different reference. There is more to what Jeremiah says than what Lanser covers. A more detailed comparative analysis of Jeremiah 5:22 with other Old Testament texts (see above) demonstrates that it fits better for a post-Flood situation. God could intervene at any time in His created world—He did so at the time of the Flood. He can contravene His own decrees and His creation’s natural boundaries for the sea. Moreover, setting a boundary after the Flood does not mean there will not be minor rises and falls of sea level, such as happened during the Ice Age or happens during an earthquake.

### Does Psalm 104:8 refer to the mountains rising and the valleys sinking?

The difficulties encountered in translating Psalm 104:6–9 contribute to the issue regarding whether the text refers to the creation or the Flood. English versions give alternative translations. Rather than stating that “The mountains rose; the valleys sank down” as quoted above in the ESV and NASB, other versions (such as the NIV<sup>20,21</sup>) translate the text as: “they [the water] flowed over the mountains, they went down into the valleys, to the place you [God] assigned for them.” Some might argue the water refers to floodwaters, others might argue the waters are the primeval waters flowing off the original continent as it rises out of the water on Day 3.

However, based upon the preponderance of evidence the ESV version provides a more accurate translation, which is similar to the New American Standard Bible. Since verse 7a states that the water fled, making the water

return in verse 8 does not appear to be an option by context. The simplest way to take the grammar and structure of the Hebrew text itself is to take the normal word order of a Hebrew sentence (the verb followed by the grammatical subject) and translate “the mountains rose; the valleys went down.” The only other use of these two verbs in a poetic text with geophysical entities occurs in Psalm 107:26: “they [the sailors] rose to the heavens; they descended to the depths”. However, the very next line of the verse (“their courage melted away”) clarifies the antecedent for “they.” Psalm 104:8 does not include that kind of clarifying statement to identify any subjects other than the nouns following each verb.

Psalm 104:8b says that the mountains and valleys ended up in the place God established for them. “Valleys” consist of depressions or possibly ocean basins. The Hebrew root word from which “valley” was derived means “split, split open” (as when the earth “split open” and swallowed Korah in Numbers 16:31 and the Mount of Olives “split” in Zechariah 14:4). Such terminology fits well with tectonic activity occurring as the floodwaters sought the lowest elevation as the mountains were rising. This corresponds with the *only way* for a global flood to drain: some areas of the crust and mantle must rise and others must sink. Taylor also interprets verse 8 as supporting vertical tectonic change.<sup>22</sup>

### Analysis of the Hebrew linguistic arguments

Although not challenging that Psalm 104:6–9 refers to the Flood, Pete Williams<sup>23</sup> contests the ESV and NASB translation of verse 8. Andrew Kulikovsky challenges both the interpretation of verse 8 and believes that Psalm 104:6–9 refers to the creation.<sup>24</sup> They give the following reasons.

First, although in the Septuagint, the nouns “mountains” and “valleys” are both considered the nominative (subject) case, Williams and Kulikovsky state that it is more likely these nouns are in the accusative (object) case. The problem with this argument shows up in the fact that the Septuagint translated Psalm 107:26 (LXX Psalm 106:26) differently than it did Psalm 104:8 (LXX Psalm 103:8). In the first case the Septuagint translators added “unto” (“they ascended unto the heavens and they descended unto the depths”). In the latter they translated without such a preposition. Since



**Figure 2.** The Precambrian granite and sedimentary rocks below Paleozoic and Mesozoic sedimentary rocks in Wyoming that were generally horizontal at the end of the Mesozoic (by Melanie Richard)

**Table 1.** Correlation of events from Psalm 104:2–9 that show the psalm does not clearly allude to the creation, but refers to both the creation and the Flood<sup>29</sup>

<b>Psalm 104</b>	<b>Genesis events</b>	<b>Entity</b>
Psalm 104:2a	Day 1—Genesis 1:1–5	Light
Psalm 104:2b	Day 2—Genesis 1:6–8	Sky
Psalm 104:3	Day 2—Genesis 1:6–8	Waters
Psalm 104:5	Day 3—Genesis 1:9–13	Earth / Dry Land
Psalm 104:6a	Flood—Genesis 7:11	The deep covers the land
Psalm 104:6b	Flood—Genesis 7:19–20	The water covers the mountains
Psalm 104:7	Flood—Genesis 8:1–3	The waters flee (recede)
Psalm 104:8	Flood—Genesis 8:5	The mountains rise and ocean basins sink
Psalm 104:9	Post-Flood—Genesis 9:11	Preservation and promise

both “mountains” and “valleys” are neuter in grammatical gender, in Greek the nominative plural is identical in form to the accusative plural.<sup>25</sup> The Septuagint translators indicate they understood Psalm 104 to be speaking of the movement of the mountains and the valleys, not the waters. That makes the Septuagint supportive of a late Flood interpretation of verse 8.

Secondly, Williams and Kulikovsky also argue that the word “valley” is feminine and the verb “descend” is masculine, violating the “grammatical agreement, which, though possible when the verb precedes the subject, is improbable.”<sup>26</sup> However, major Hebrew grammars indicate that the masculine plural verb is preferred to the feminine plural verb even when the subject is feminine plural:

"This form is often replaced by the 3rd masc. pl. form, especially when the verb precedes: Jdg 21.21 **וְאֶזְרָא בְּנוֹת-שִׁילּוֹן** *the daughters of Shiloh will come out*; 1Kg 11.3b; Lv 26.33 **עָרֵיכֶם יִהְיוּ חֲרֵבָה** *your cities shall be a ruin;* ..."<sup>27</sup>

In Psalm 104:8 the verbs do precede their subjects, thereby negating any possible argument attempting to make the grammar an anomaly.

Third, Williams and Kulikovsky take “waters” (from v. 9) as the subject of the masculine plural verbs “pass over” and “return” (see also v. 7). Therefore, the verbs “ascend” and “descend” may govern the direct accusative, making the NIV the correct translation and eliminating verse 8 as a reference to tectonic activity. We have already responded to that argument above in our comparative analysis with Psalm 107:26.

Kulikovsky adds three more reasons. Fourth, in verse 8c, the word translated “place”, where the waters ended

up, means a geographical position in Hebrew. The mountains changing geographic position would not make much sense if the mountains were the subject. In response, we point out that the Hebrew for “place” fits the relocating of mountains and ocean basins from where they were located in the pre-Flood world. The tectonics at work during the Flood, especially late in the Flood, resulted in totally new mountain ranges on the earth’s surface as well as new seas.

Fifth, the word translated “appointed” or “assigned” is in the qal perfect meaning a completed action in the past. Thus, the assignment of the places had already been established by God, probably in Genesis 1:9 during the creation. We respond that this argument ignores the way the use of the Hebrew

verb depends upon its context and its relative timeframe with regard to the writer. When the psalmist wrote that the assigning of place was completed, it was completed before his time. That leaves it quite open as to when exactly it occurred. Both the Flood and creation predated the psalm's composition. The use of the qal perfect form of the verb does not decide anything here.

Sixth, Kulikovsky believes verses 6 to 9 clearly refer to the creation: "Secondly, the Psalm clearly alludes to the first three days of creation rather than the flood."<sup>28</sup> An analysis of Psalm 104:2–8 parallel to Genesis, however, results in the correlations in chronological order in table 1.

Therefore, the bulk of the evidence supports the view that Psalm 104:6–9 points to Noah’s Flood. Barrick concludes that “structural, grammatical, and word study analyses point to the Flood as the historical event referred to by Psalm 104:6–9, rather than creation.”<sup>12</sup> Verse 8 also supports the idea that the mountains rose and the valleys sank to drain the floodwater. Barrick summarizes:

"Psalm 104's structure, literary devices, grammar, and word studies support the preservation of the simplest understanding of the Hebrew text in verse 8:

‘The mountains rose; the valleys sank down.’<sup>30</sup>

Although someone could argue, with some degree of possibility, that the psalmist could be using the nouns in verse 8 as adverbial accusatives of location, the context does not signal anything other than normal word order taking the nouns as subjects.<sup>31</sup> Barrick also argues that “the psalmist maintains the imperfect form for the verbs, but drops the final *nun* suffix,” which could signal a change of grammatical subject from “waters” in verse 7 to “mountains” and “valleys” in verse 8. Hoftijzer identifies the primary function of such *n*-suffixed

**Table 2.** Elevations of granitic rocks of the upper crust in some mountain ranges and below the sedimentary fill in adjacent basins in Wyoming<sup>35,36</sup>

Mountains		Basins	
Wind River Mountains	14,000 feet	Wind River Basin	-23,000 feet
Beartooth Mountains	13,000 feet	Bighorn Basin	-21,000 feet
Bighorn Mountains	13,000 feet	Powder River Basin	-14,000 feet
Medicine Bow Mountains	12,000 feet	Hanna Basins	-31,000 feet
Owl Creek Mountains	9,000 feet	Washakie Basin	-21,000 feet
Laramie Range	10,000 feet	Red Desert Basin	-23,000 feet
		Green River Basin	-14,000 feet



**Figure 3.** Tilted Paleozoic and Mesozoic strata at the north-west edge of the Bighorn Basin at Clark Canyon due to vertical tectonics between the Beartooth Mountains that rose and the Bighorn Basin that sank

verbs as contrastivity,<sup>32</sup> which suits a change of grammatical subject in contrast to the immediately surrounding verses.

### Geology is consistent with Psalm 104:8 during the Flood

Although not a proof of the ESV and NASB translations of Psalm 104:8, geology is consistent with it. For instance, in the state of Wyoming, USA, it can be shown that at one time the granitic upper crust, which was nearly flat at one time and is part of the Great Unconformity in this area (figure 2),<sup>33,34</sup> now is separated by up to 13,000 m between the mountains and the bottom of the sedimentary rocks in the valleys (figure 3).<sup>35</sup> This is called differential vertical tectonics, i.e. the mountains rose and the valleys, or basins (wide valleys) in this case sank. Table 2 shows the elevations in Wyoming of the upper crust (the Great Unconformity) on the tops of the mountains

and deep below the sedimentary rocks in the basins.

Moreover, differential vertical tectonics are easily inferred all over the earth. Evolutionary geomorphologist and world traveller, Lester King writes:

“So the fundamental tectonic mechanisms of global geology are vertical, up or down: and the normal and most general tectonic structures in the crust are also vertically disposed ... But one must bear in mind that every part of the globe—on the continents or in the ocean basins—provides direct geological evidence that formerly it stood at different levels, up or down, and that it is subject to *in situ* vertical displacements.”<sup>37</sup>

### Conclusions

We have shown that Psalm 104:6–9 most likely refers to the Flood. Besides the straightforward reading pointing to the Flood, such as verses 6 and 9 referring to a covering of the earth and its mountains and verse 9 referring to the boundary set for the oceans that the water would not return “again to cover the earth”. The usage of the word “rebuke” with water in verse 7a is used elsewhere in biblical Hebrew poetry of protecting someone or something

threatened with disaster. Following the catastrophic Flood of Noah’s day such protection provides assurance that it will not happen again—just as God promised in Genesis 9:11–17. The psalm is not a creation psalm but rather a psalm of praise for God’s greatness, power, and providence over His creation throughout history.

Proof texts for the verses referring to the creation are analyzed and found equivocal. The proof texts, Job 38:10–11 and Proverbs 8:29, likely refer to the *general* rule of the sea set at creation, which God can contravene. A more detailed comparative analysis of Jeremiah 5:22 with other Old Testament texts demonstrates that it fits better for a post-Flood situation.

An analysis of verse 8 as “The mountains rose; the valleys sank down” makes sense with other verses within the psalm and suggests vertical tectonics late in the Flood to drain the floodwaters.

Some consider there are linguistic reasons for belief that these verses refer to the creation and/or that verse 8 does not refer to Flood tectonics. We analyzed these linguistic arguments and found them either equivocal or supportive of the Flood.

Geology and geophysics from all over the world is also consistent with this interpretation of verse 8 as the mountains rose and the valleys sank.

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# What's so great about *Tiktaalik*?

John Curtis

*Tiktaalik roseae* was a fossil find that received a great deal of media attention in 2006. It was widely hailed as a ‘missing link’ between fish and tetrapods. It seemed to show some features in common with fish, others with tetrapods, and a few that seemed somewhat intermediate between fish and tetrapods. However, subsequent analysis and research has shown that many of these claims were unsupported. Evolutionists themselves disagree on how ‘transitional’ aspects of its anatomy really are. Tetrapod trackways discovered in Poland in 2010 were dated 14 million years older than the earliest tetrapod fossils and 5 million years older than all known elpistostegid body fossils. This calls into question the transitional nature of not just *Tiktaalik*, but of all known elpistostegids. Finally, statistical baraminology (a creationist research enterprise aimed at detecting discontinuity between different taxa) showed no statistically significant correlation between *Tiktaalik* and tetrapods, which is consistent with them being separate biblical kinds. Further research has shown that *Tiktaalik* is much friendlier to biblical creation than first expected.

## Background on *Tiktaalik*

It has been 15 years since University of Chicago researchers led by Neil Shubin discovered the *Tiktaalik roseae* fossils. Is it still “the perfect missing link”<sup>1</sup> as Richard Dawkins extolled?

Shubin and Daeschler first published their discovery of *Tiktaalik* in the 6 April 2006 edition of *Nature*. Several specimens were unearthed in the Canadian Arctic in 2004, some as long as 2.7 m (9 ft) (figure 1).

*Tiktaalik*’s discovery came in the context of paleontologists seeking to fill the supposed evolutionary gaps between fish and tetrapods. Late Devonian lobe-finned fish called elpistostegids (which includes *Tiktaalik*) allegedly fill that gap. Both Ahlberg<sup>3</sup> and Garner<sup>4</sup> provide helpful discussions of how evolutionists have so far sought to explain the supposed fish-to-tetrapod transition through that timeframe.

*Tiktaalik* allegedly contributed to this because it reportedly had more tetrapod-like features than other elpistostegids like *Panderichthys* (figure 2).

“Like *Panderichthys*, *Tiktaalik* has paired fins and a dorsal surface covered with overlapping rhombic scales. However, the snout is even more elongated, the spiracle is even larger and there is no bony opercular cover. Furthermore, *Tiktaalik* is distinguished from other tetrapodomorph fishes by possession of imbricate ribs, and a pectoral girdle with enlarged scapular and coracoid elements and highly mobile elbow-like and wrist-like joints. The head is also detached from the shoulder girdle, allowing flexure in the neck region. These features would have allowed the animal to support itself on a substrate using its pectoral fins in a limb-like manner.”<sup>7</sup>

Ahlberg notes:

“*Tiktaalik* and *Panderichthys* are straightforward fishes: they have small pelvic fins, retain fin rays in their

paired appendages and have well-developed gill arches, suggesting that both animals remained mostly aquatic. In other regards, *Tiktaalik* is more tetrapod-like than *Panderichthys*. The bony gill cover has disappeared, and the skull has a longer snout.”<sup>8</sup>

Daeschler heralded *Tiktaalik* as:

“... a well-preserved species of fossil sarcopterygian fish from the Late Devonian of Arctic Canada that represents an intermediate between fish with fins and tetrapods with limbs, and provides unique insights into how and in what order important tetrapod characters arose.”<sup>9</sup>

Shubin’s 2006 paper highlighted *Tiktaalik* as having four tetrapod-like pectoral appendages that were “morphologically and functionally transitional between a fin and a limb”.<sup>10</sup> Much fanfare followed these first papers on *Tiktaalik*, with many commentaries extolling how the body features of *Tiktaalik* show it was the ‘missing link’ between fish and tetrapods. Models were built showing it standing up on its fins out of the water, and Shubin wrote a book titled *Your Inner Fish*<sup>11</sup> (which spawned both a PBS television series and even a song titled “Tik-tik-tik-tik-tiktaalik”<sup>12</sup>).

## Details, details

In spite of this fanfare, the details provide a much different story. Other researchers soon began to temper the initial hype surrounding *Tiktaalik*. In 2008 Boisvert noted that:

“Given that recent phylogenies consistently place *Panderichthys* below *Tiktaalik* in the tetrapod stem group, it is surprising to discover that its pectoral fin skeleton is more limb-like than that of its supposedly more derived relative. ... It is difficult to say whether this character distribution implies that *Tiktaalik* is autapomorphic, that *Panderichthys* and tetrapods are

convergent, or that *Panderichthys* is closer to tetrapods than *Tiktaalik*.<sup>13</sup>

Clack similarly notes that *Panderichthys* is in many respects closer to tetrapods than *Tiktaalik*.<sup>14</sup> One is left to wonder if *Tiktaalik* had fins that de-evolved before they supposedly re-evolved to a more advanced form. This is in fact what Ahlberg stated in a *National Geographic* news article:

“Curiously, the radial bones of *Panderichthys* are more finger-like than those of *Tiktaalik*, a fish with stubby leg-like limbs that lived about five million years later. Many scientists regard *Tiktaalik* as a ‘missing link’: the crucial transitional animal between fish and the first tetrapods. One possibility, Ahlberg said, is that finger development took a step backward with *Tiktaalik*, and that *Tiktaalik*’s fins represented an evolutionary return to a more primitive form.”<sup>15</sup>

Ahlberg later states with Clack that *Tiktaalik*’s fin is actually far removed from the functional architecture of a tetrapod arm:

“Although these small distal bones bear some resemblance to tetrapod digits in terms of their function and range of movement, they are still very much components of a fin. There remains a large morphological gap between them and digits as seen in, for example, *Acanthostega*: if the digits evolved from these distal bones, the process must have involved considerable developmental repatterning.”<sup>16</sup>

Ahlberg also raised doubts about Shubin’s claim that the lepidotrichial fin webs of *Tiktaalik* were substantially smaller (i.e. more tetrapod-like) than those of *Panderichthys*. He pointed out they are actually about the same length.<sup>17</sup> With respect to *Tiktaalik*’s jaw, Ahlberg noted how *Livoniana* (contemporary with *Panderichthys*) fossils have a lower-jaw morphology more tetrapod-like than that of *Tiktaalik*.<sup>18</sup>

Woodmorappe wrote that creationists have a working definition of what would constitute a bone fide transitional fossil as being one in a series of fossils which show “a series of ever-more-primitive sister groups, each of which

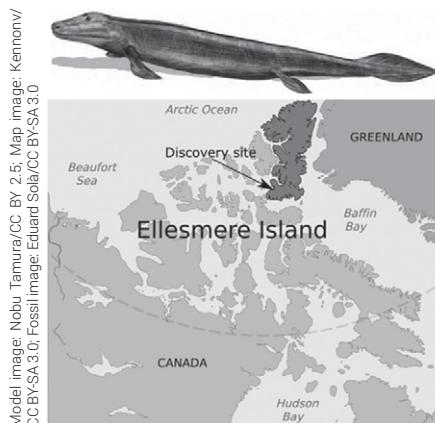
is discontinuity-free, towards both its stemward and the crownward forms, none of which has any specializations.”<sup>19</sup> Clearly, *Tiktaalik* fails to meet this criterion. One could not then logically or scientifically deduce *Tiktaalik* is an unequivocal transitional fossil when it has ‘more primitive’ features than its proposed stemward forms, unless one proposes undocumented and unsupported evolutionary events, such as taking ‘a step backward’. Comments like ‘a step backward’ are nothing more than evolutionary just-so stories.

On this point Ahlberg relates that “we should be mindful that evolution has no overall aim and that small-scale reversals and parallelisms are commonplace phenomena.”<sup>20</sup> In other words, evolutionists believe their theory does not require that traits evolve at constant rates in different lineages, or that there must be a neat and unidirectional progression in the fossil record from ‘more primitive’ to ‘more derived’. As such, ‘geologically instantaneous developmental repatternings’ such as those found in *Acanthostega* are standard. This however is a retreat forced by the evidence from classic evolutionary constructs of creatures undergoing simple-to-complex development over much time to much less falsifiable constructs like ‘mosaic evolution’.<sup>21</sup> Indeed, since this effectively turns *any* fossil into a potential ‘transitional fossil’, how can evolutionists know what then constitutes a true transitional fossil?

Concerning the popular portrayal of *Tiktaalik* being able to venture out on land, Shubin and others state:

“Plesiomorphic features of *Tiktaalik* can be interpreted as highlighting a functional difference with limbed forms: the pelvic fin was not capable of bearing stresses and strains as significant as those of *Acanthostega* and *Ichthyostega*, nor was the musculature as well-developed for appendage retraction.”<sup>22</sup>

The sacral rib connecting the pelvic girdle to the vertebral column is essential for tetrapods to be able to bear their weight on land,<sup>23</sup> so as Shubin admits, *Tiktaalik* could not have walked on land. This is quite odd considering the number of comments and pictures depicting *Tiktaalik* doing just that.<sup>24</sup>



**Figure 1.** A model of *Tiktaalik roseae* (left) based on the fossil remains (right) which were unearthed in 2004 in the Canadian Arctic by University of Chicago researchers led by Neil Shubin.<sup>2</sup>

In stark contrast to Shubin's assertion: "New discoveries of transitional fossils such as *Tiktaalik* make the distinction between fish and the earliest tetrapods increasingly difficult to draw",<sup>25</sup> Ahlberg and Clack provide an astonishing observation:

"Of course, there are *still major gaps* in the fossil record. In particular we have almost no information about the step between *Tiktaalik* and the earliest tetrapods, when the anatomy underwent the *most drastic changes*, or about what happened in the following Early Carboniferous period, after the end of the Devonian, when tetrapods became fully terrestrial [emphases added]."<sup>16</sup>

The evolutionists themselves have pointed out that *Tiktaalik* couldn't venture out on land as modern lungfish do; its lobe fins, jaw, and skeleton are more primitive than its supposed evolutionary predecessors; the most drastic changes between fish and tetrapod came after *Tiktaalik*; and major gaps still exist in the fossil record. This is a far cry from the initial hype surrounding *Tiktaalik* being "the perfect missing link".

### Pulling the rug out

In 2010 fossilized footprints of a tetrapod were found in the Zachełmie Quarry in the Holy Cross Mountains of Poland. They were originally dated as being "18 million years older than the earliest tetrapod body fossils and 10 million years earlier than the oldest elpistostegids"<sup>26</sup> (figure 3). Narkiewicz and Narkiewicz later revised these dates in 2015 as predating the earliest tetrapod body fossils by 14 million years and the oldest elpistostegids by 5 million years.<sup>27,28</sup>

Tas Walker's paper in 2010 aptly described this issue and how many evolutionists were taken aback by this turn of events as it essentially meant the evolution of tetrapods was much earlier, and worst of all there were now no fossils to fill that void.<sup>30</sup> Eight years later, Ahlberg discussed this controversy and noted that early reactions to discredit these tracks have proved fruitless. He echoes exactly what Walker pointed out in 2010:<sup>31</sup> "Suffice it to say for now that the tetrapod identity of the Zachełmie, Valentia Island, Tarbat Ness and Genoa River tracks is upheld."<sup>29</sup>

Ahlberg also recounts how the Zachełmie Quarry tracks upended the previously tidy chronology of evolutionary development from Devonian fish to tetrapods, and that no resolution to understanding the evolutionary progression of fish to tetrapod is in sight:

"And so here we are, in 2018, still locked in an impasse between two fundamentally incompatible timelines for the origin of tetrapods, each with its followers."<sup>20</sup>

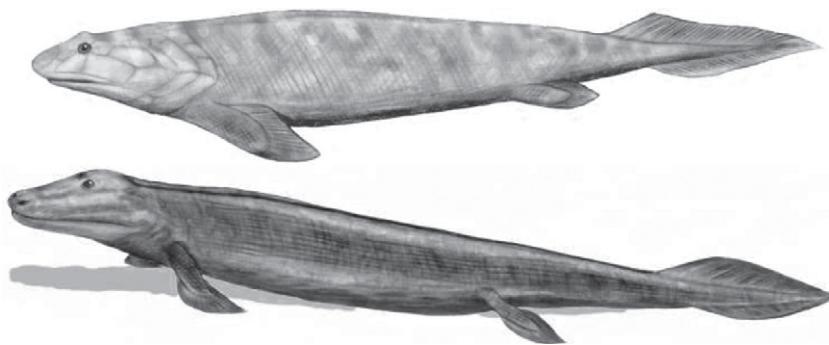


Image: Nobu Tamura/CC BY 2.5

**Figure 2.** *Panderichthys* (above), an Upper Devonian lobe-finned fish (from Clack<sup>5</sup>) compared to *Tiktaalik roseae* (below, from Shubin<sup>6</sup>)

Evaluation of the situation has led him to offer a hypothesis that tetrapods evolved much earlier than previously thought (by at least 14 million years) and were derived from lungfish ancestors. During that time, other creatures (such as *Tiktaalik*) branched off and evolved along separate lines and lived as contemporaries of tetrapods. He admits, however: "there is not a single piece of body fossil evidence to support [this hypothesis]."<sup>32</sup> Interestingly, the need for an earlier evolution of tetrapods was the same concept voiced in 2010 by Philippe Janvier from the National Museum of Natural History, Paris, France.<sup>33</sup> Furthermore, Ahlberg emphasizes:

"The single most important take-home message from this survey of the evidence is that the fossil record of the fish–tetrapod transition is actually very poor and consists mostly of gaps."<sup>32</sup>

So what then becomes of *Tiktaalik*?

"The idea of *Tiktaalik* as an immediate predecessor of tetrapods, which has been promulgated both in the scientific literature (Daeschler *et al.* 2006; Shubin *et al.* 2006) and in innumerable popular presentations, must thus be discarded if the footprint evidence is accepted; instead, *Tiktaalik* and *Elpistostege* are cast in the role of late survivors of the elpistostegid radiation."<sup>32</sup>

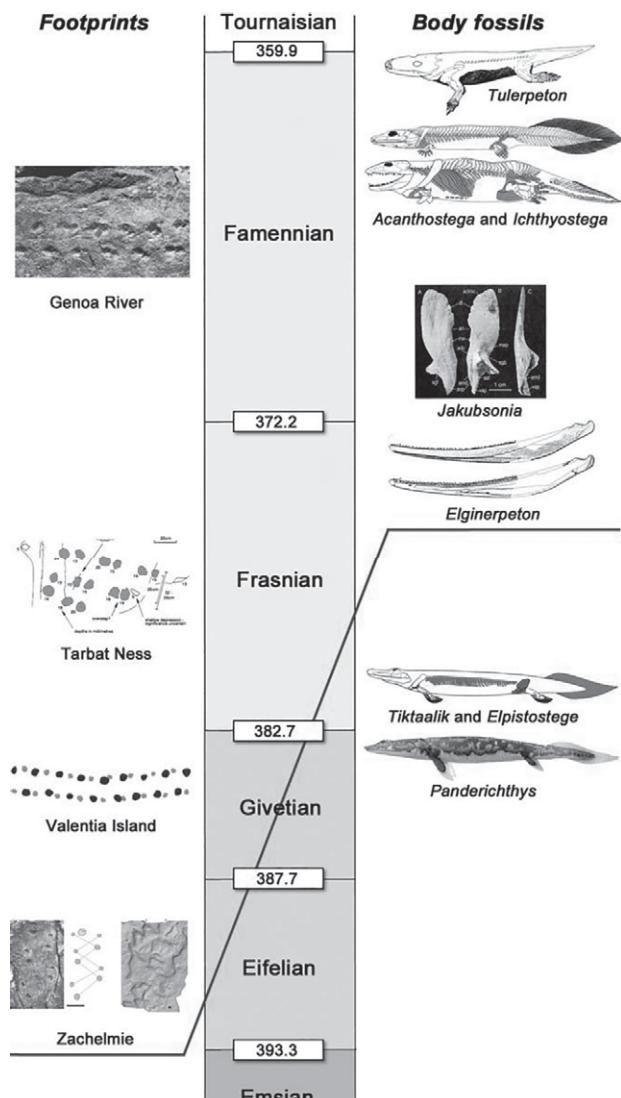
Unwilling to discard decades of comparative anatomy evaluation on multiple fossil forms, Ahlberg still tries to tie *Tiktaalik* and the other elpistostegids into an evolutionary cladogram of fish-to-tetrapod evolution. He maintains that these morphological intermediates can still be useful in illuminating the origin of tetrapods even though they are in no sense a temporal intermediate or ancestor.<sup>34</sup> Based on his previous comment that his hypothesis has absolutely zero body fossil evidence, this is only conjecture.

### Appearances can be deceiving

What about the extensive commentary on comparative anatomy between fossil forms? It is one of the main things evolutionists use to argue for evolution. As noted above, Ahlberg still values the vast amount of existing comparative anatomy information in spite of the dating dilemma with *Tiktaalik* being much younger than true tetrapod tracks.

Also, in the nine years since the *Zachelmie* tracks have been found, Shubin appears to have authored only one paper on *Tiktaalik*; in it he only discusses the robustness of its hip (again, relying on comparative anatomy) as rationale for it being still considered an intermediate form.<sup>35</sup>

A curious fact emerges with using comparative anatomy to evaluate fish as having tetrapod-like features (or any alleged evolutionary development): one consistently ‘sees’ only creatures with fully formed systems. We don’t see creatures whose systems are partially developed (as in the process of being evolved). As Garner notes:



**Figure 3.** Timescale of the Middle and Late Devonian showing relative ages of salient tetrapod footprints (left) and body fossils (right). Numbers in the middle boxes denote stage boundaries using evolutionary-based ages (millions of years). The line connecting *Zachelmie* and *Elginerpeton* indicates the age of the earliest tetrapod footprints (left) and earliest tetrapod body fossils (right). The temporal mismatch between the *Zachelmie* footprints and *Tiktaalik* is evidenced. The ages of Tarbat Ness and Genoa River are approximate but all others are tightly constrained (from Ahlberg<sup>29</sup>).

“Evolutionary theory might lead us to expect examples of intermediate structures, but there is nothing intermediate about, for example, the internal gills of *Acanthostega*, its lateral line system, or its limbs. They are fully developed and highly complex.”<sup>36</sup>

When it comes to *Tiktaalik*, this issue is just as valid according to Ahlberg:

“It is tempting to view elpistostegids simply as an intermediate step in a directional evolutionary progression, but of course they were nothing of the sort; like all organisms, they were adaptively optimized for their own lifestyle and not ‘on their way’ to anywhere.”<sup>37</sup>

There is a lot missing from the fossil record contrary to what is predicted/required by the evolution model. Where are all the thousands of hypothesized creatures with systems undergoing evolutionary transition? The short answer is: they are missing.

Can one really infer phylogeny from comparative anatomy? Creationists maintain that such efforts are fruitless since Scripture states that God created living things according to their kinds, there should be defined gaps between these kinds of creatures. Common features are understood as being designed by a common Creator, who developed a range of biological structural concepts for the many kinds of creatures, and used similar structures within different kinds of creatures when they were to inhabit similar ecosystems or operate in a similar manner.

Baraminology is a recent study effort to quantify where those gaps exist. Instead of using comparative anatomy concepts to prove phylogeny, creationists are specifically expecting there are boundaries between kinds of creatures and developing means to quantify those boundaries (because there are structures that appear visually similar). Garner and Asher employed baraminic distance correlation (BDC) and three-dimensional MDS (multidimensional scaling) to determine if there are any morphological (that could also represent phylogenetic) discontinuities that exist between the various fossils (the Devonian tetrapods and the elpistostegids) in the fish-to-tetrapod ‘transition’.<sup>37</sup> Seven sets of data were evaluated in their study, and in the end four showed no positive correlations between elpistostegids and tetrapods, with the other three showing negative correlations.<sup>38</sup> Garner and Asher conclude:

“Our ability to detect discontinuity between the Devonian tetrapods and the elpistostegids is especially noteworthy, given that the Devonian tetrapods possess many fish-like characters and the elpistostegids possess many tetrapod-like characters. Theoretically, taxa that share characteristics of fish and tetrapods could have bridged the gap between these two groups, but our BDC and MDS analyses support separating them into distinct clusters even when such intermediate forms are included.”<sup>38</sup>

This supports the claim creationists consistently make that these fossil forms have no common ancestry.

## Conclusion

What is so great about *Tiktaalik*? It falls far short of all the hype and terms of an evolutionary icon, and is essentially dethroned.

Evolutionists themselves have described several critical problems with *Tiktaalik*:

- It has structures more primitive than its supposed evolutionary predecessors;
- It could not venture out on land as modern lungfish do;
- The most drastic changes between fish and tetrapod were not present in *Tiktaalik*;
- Tetrapods already existed millions of years before *Tiktaalik*, which obscures how *Tiktaalik* fits into an evolutionary transition, and;
- Major gaps still exist in the fossil record even with the discovery of *Tiktaalik*.

Comparative anatomy studies by evolutionists show that all fossils examined exhibit mature, fully functional structures, and that these creatures would be perfectly adapted (designed) for their environments. No fossil remains to date (including *Tiktaalik*) show structures that are ‘in transition’. In terms of comparative anatomy, Mathematical BDC and MDS analysis confirms there are significant morphological gaps between tetrapods and elpistostegids (such as *Tiktaalik*), consistent with biblical creation. Evolutionists frankly admit that gaps in the evolutionary progression of tetrapods are the rule, not the exception.

So, the post-discovery history of *Tiktaalik* creates more problems than it solves for evolutionists. However, it fits well into a creationist understanding of diversity and the fossil record. *Tiktaalik* turns out to be a better witness to the truth of the Bible and the Creator God who designed it than it seemed from the early hype surrounding its original discovery.

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# Phrenology—a myth behind Darwinism

Jerry Bergman

The history of the phrenological movement is reviewed, focusing on its influence on evolutionary thought, specifically on Darwin himself as well as the co-founder of evolution, Alfred Russell Wallace. Why the movement became enormously popular, and the harm it caused by diverting attention from better theories of behaviour causation, is explored. Other harm it caused included fostering racism, and indirectly helping to open the door to materialism, naturalism, and Darwinism. The idea has been rejected today with solid scientific evidence. It is not only baseless but irresponsible, and has misled many people due to its erroneous conclusions. Ironically, it was empirically disproved only in 2018.

**O**n my desk sits a white porcelain phrenology model of a bald human head covered with words and lines representing different brain areas. Phrenology theory essentially interprets bumps (called peaks) on the skull surface as brain areas that are more developed, and indentations (called valleys) as brain areas that are less developed (see figure 1). Phrenology focused only on surface head features, not the brain's interior, which is the proper study of the brain.<sup>1</sup> Phrenology was mainstream for decades until it was largely debunked by several limited studies in the early 1900s. It was empirically totally discredited only in 2018 by the largest, most carefully designed study ever completed on phrenology. This study used MRI neuroimaging on 5,724 subjects, producing 40,962 vertex measures of the skull for each subject which were compared with a set of lifestyle parameters drawn from the same subjects.<sup>1</sup>

## Its history

The founding of phrenology has been attributed to Franz Joseph Gall, a Viennese medical doctor and anatomist, in 1796. The idea was influential throughout most of the 19<sup>th</sup> century. The term ‘phrenology’—Greek φρήν (phrēn), ‘mind’, and λόγος (logos), ‘knowledge’—involves measuring bumps on the skull surface in an attempt to predict mental and personality traits. It is based on the materialistic concept that the brain is the mind, and the mind has no existence aside from the physical structure of this organ.<sup>2</sup> Although many persons contributed to its early development, almost from the beginning the movement was naturalistic and anti-biblical, which later attracted Darwin to the theory.<sup>3</sup>

Phrenology is based on the belief that storage of the many parts of the ‘mind’ must be localized in certain brain areas which have specific functions. Although the general functions of some parts of the human brain have been confirmed by empirical research, mostly from studies of

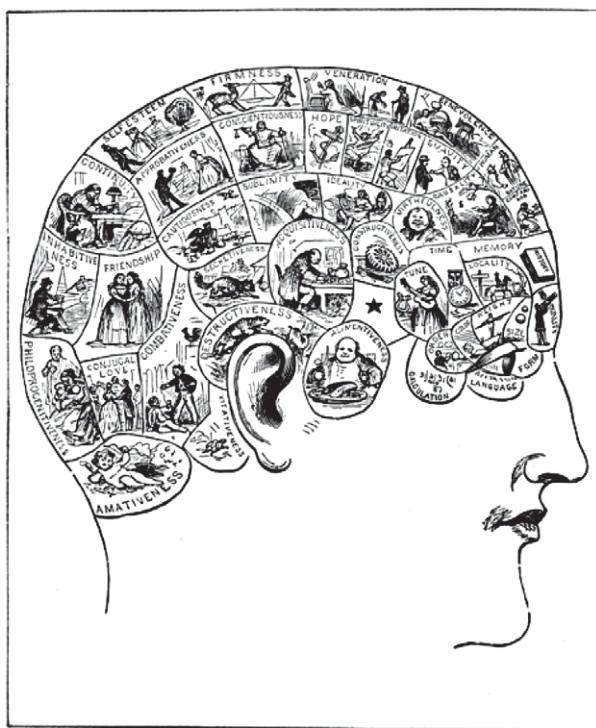
brain damage, phrenology went well beyond the empirical evidence known when phrenology was popular.

Although it was recognized that some brain structures, such as the brain stem, function like separate organs as phrenology predicted, phrenologists were concerned mainly with the brain cortex, as well as the cerebellum, which is involved in the coordination of muscle control and motor skill learning—and not the brain stem.

Researchers now have some understanding of the function of many portions of the cortex. For example, the frontal cortical lobe, located at the front of the brain, is associated with reasoning, motor skills, higher level cognition, and expressive language, but we have only been able to isolate general areas that control these functions. Furthermore, phrenologists evaluated only the cortex and cerebellum surface areas as reflected in their effect on the skull, ignoring the brain's interior. Phrenology was for this reason derisively referred to by some as bumpology, or craniology.<sup>4</sup> External measurements are obviously invalid measures of the brain's internal structure because the thickness of the skin, bones, dura mater (uppermost meninges), and other tissues varies, distorting measurements of the cortex.

Not all phrenologists accepted the ideas behind phrenology, and some who rejected phrenology accepted a related idea, physiognomy. Physiognomy was the belief that character can be read in the face and other body parts. Phrenological journals also published numerous articles on physiognomy. One article (figure 2) discussed moral character as revealed in nose shape and traits, an idea later exploited to debase Jews and other ethnic groups.<sup>5</sup> Some phrenologists taught that the brain is actually composed of different separate organs, not just areas.<sup>6</sup> The organ theory concluded that the bumps represent larger organs, a focus called organology.

Most of the behaviour traits the phrenology system measured require much subjective judgment. Examples include a disposition for delight in colours, circumspection, pride,



**Figure 1.** Phrenology chart showing the personality traits supposedly associated with various areas of the skull (from *People's Cyclopaedia of Universal Knowledge*<sup>71</sup>)

arrogance, love of authority, and the impulse to propagate (have large families). A major appeal of phrenology was that it “was seductively simple and logical … it both entertained and educated”.<sup>7</sup>

According to one of the early founders of phrenology, Franz Gall, 27 distinct organs exist in the brain which produce 27 different faculties. He later looked for a few more distinct organs and the number eventually reached 42.<sup>8</sup> These included ones in persons with a mirthful disposition (i.e. liking to laugh), who supposedly had two prominent bumps on their forehead compared to their more dour contemporaries.<sup>1</sup>

### Its importance

Throughout the 19<sup>th</sup> century intellectuals discussed the relationship between nature, secularism, and religion. What the “Left found most attractive in phrenology was that it offered the masses an alternative to religion as a means of explaining the world.”<sup>9</sup> It is often assumed that the scientific naturalism propagated by writers such as T.H. Huxley and John Tyndall was the result of the ‘Darwinian revolution’ unleashed in 1859. Darwin’s work, though, existed in the context of the vigorous debates about naturalism that were taking place before Darwin penned his 1859 *Origin*

book. At the forefront of these debates were phrenology advocates who applied their theories to subjects ranging from medicine, treatment of the insane, education, theology and even economics.<sup>10</sup> Ideas about naturalism and natural law were often first born in early phrenology controversies. One book in particular, *The Constitution of Man in Relation to External Objects* (1828) by phrenologist George Combe, “replaced God with natural laws”, and had an enormous influence on scientific thinking and the popularity of the ‘naturalistic movement’.<sup>11</sup>

The *Constitution*, published from 1828 to 1899, sold over 350,000 copies throughout the world, far more than the 50,000 copies of Darwin’s *Origin of Species* during the same period.<sup>12</sup> It also at first surpassed Darwin’s 1859 book both in importance and intellectual heat generated, and its natural law philosophy influenced Darwin’s *Origin*.<sup>13</sup> Furthermore, the phrenological community “was rich soil for naturalistic thinking”, creating a large population that influenced acceptance of this worldview.<sup>14</sup>

“[It] impressed hundreds of thousands of readers with a plausible alternative sense or narrative for the world to that of the traditional Christianity. It was largely this alternative sense to the world and the potential threat to traditional Christian-based understanding of Man which made *Constitution* so controversial.”<sup>15</sup>

Combe was also in complete agreement with the “sweeping account of the evolution of life” in Robert Chambers’ book *The Vestiges of the Natural History of Creation*, the first book to introduce evolutionary theory in detail to the world.<sup>16</sup> And Chambers was in almost complete agreement with phrenology, even ending his *Vestiges* book with an endorsement of the idea.<sup>17</sup> Chambers was enormously influenced by, and embraced, the doctrine of natural law from *Constitution*.<sup>18</sup> He also cited some of the scientific studies of the man regarded as phrenology’s founder, Dr Gall, and drew on “phrenology for further evidence as to the materiality of mind”.<sup>19</sup>

Thus, as early as 1844 the phrenology movement had endorsed evolution. The only area of disagreement evident was that Combe did not agree with Chambers’ “assertion that organic life arose from chemical processes”, referring to naturalistic abiogenesis.<sup>16</sup> Nonetheless, reviews of *Vestiges* published in *The Phrenological Journal* were uniformly positive.<sup>20</sup> One review defended the book, and condemned critics, writing that “men of science did not confine their attention to its alleged objections, but urged against its moral and theological objections, calculated to rouse popular prejudices against the unknown author and his work”.<sup>20</sup>

The progressive phrenologists soon also adopted Darwinism into their theory since many similarities existed

between the phrenological and Darwinian worldviews. For example, like “Darwinism, phrenology left the laboratory and thereafter its ‘proof’ lay in debating forums and public acceptance, not in scientific experiments”<sup>21</sup>

### Phrenology and materialism

Soon practitioners in various science disciplines incorporated phrenology into their worldview. Professor John Davies concluded phrenology “was a precursor of the larger Darwinian movement; years later the same audience who heard Fowler’s lectures [on phrenology] and bought Combe’s books [on phrenology] would be listening to Robert Ingersoll [lectures on atheism] and reading Thomas [Huxley’s books on evolution]”<sup>22</sup> In 1858 the leader of the secular society wrote:

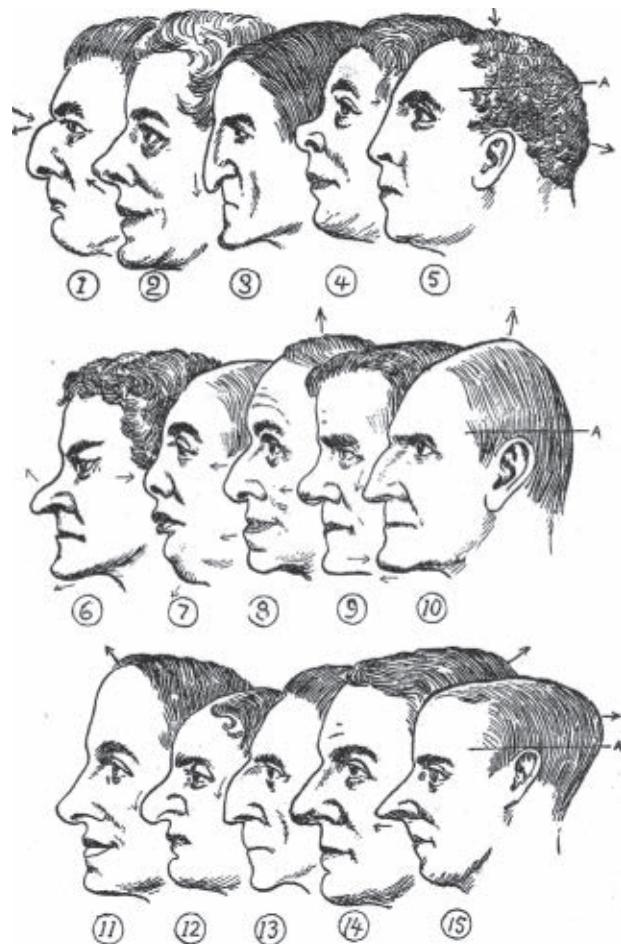
“More converts have been made this last century by *The Constitution of Man* to freethought than any other agency . . . They hailed phrenology as an atheistic and naturalistic doctrine, a fresh source of ammunition to use in the ongoing battle against revealed religion.”<sup>23</sup>

Phrenology also “provided a way station on the road to a secular view of life . . . [and] prepared the way for [Darwin’s] *On the Origin of the Species*”<sup>24</sup> As McLaren observed in his study of phrenology, the “role played by phrenology in early evolutionary theory has not been fully appreciated”<sup>25</sup> Furthermore, the acceptance of Darwinism gave phrenology a major boost.<sup>26</sup>

### The Darwinian phrenology theory

The theory behind phrenology began with the premise of materialism, and that the human brain, like any other organ, developed by naturalistic means. No soul was needed to explain humanness. To early evolutionists, the implications of phrenology were obvious: the brain, and therefore the mind, evolved like any other organ.<sup>27</sup> This supported the notion that the human brain evolved from an ape common ancestor which had a smaller brain. Our enormous language, creative, artistic, musical, and mechanical abilities resulted from adding on to the ape brain. Humans allegedly still retain the primitive brain which is located in the occipital area, and the enlargement of this part on the human skull indicates humans have retained many primitive traits. Phrenology and evolution supported and reinforced each other, especially after the 1860s when phrenologists often related their theory to evolution, especially the supposed evolution of the head and skull.

Some of phrenology’s major critics were clergy, who correctly concluded that phrenology promoted materialism and fatalism, and had dispensed with the need for the human



**Figure 2.** Basic nose shapes which some phrenologists used in addition to skull traits to determine personality (from Parks<sup>5</sup>)

soul.<sup>28</sup> Even though many phrenologists were not atheists, the underlying conclusion of phrenology was materialism, a view supported by many of its leaders. Materialism teaches that mind is purely matter and nothing more; humans have no soul, and death is the final end of life.<sup>29</sup> One example of Darwin’s exposure to this line of thinking was from his undergraduate friend, phrenologist William A.F. Browne.<sup>30</sup> When Darwin was a University of Edinburgh Medical School student he was an active member of a student group, which included a few professors, called the Plinian Society.<sup>31</sup>

As a student, Darwin observed the 1826–1827 debates involving his friend Browne, who is now considered the founding father of British Psychiatry.<sup>32</sup> Browne’s behaviour in the Plinian Society debate was as a “fiery radical” who “gave such an inflammatory harangue on matter and mind that it sparked a raging debate . . . with no soul, no after-life, no punishment or reward, where was the deterrent against immorality?”<sup>34</sup>

Browne, who openly influenced Darwin, “believed the mind to be completely understandable in terms of material

processes, and relished a thorough demolition job on metaphysical and Christian fantasies".<sup>32</sup> Gruber's careful studies of Darwin's early writing concluded the Plinian event played a crucial role in Darwin's thinking and even his psychological development.<sup>33</sup>

In 1838, Darwin revisited Edinburgh and his former undergraduate haunts, recording his psychological speculations in his M notebook—the 'M notebook' was one of many notebooks that Darwin used to record his notes on his ideas on evolution.<sup>40</sup> Darwin was then preparing to marry his Unitarian cousin, Emma Wedgwood, and was in some emotional turmoil due to their religious conflicts. On September 21, after his return to England, he recorded a vivid and disturbing dream in which he was involved in an execution. The corpse came to life and claimed to have died as a hero. This dream was quite likely related to his conflicts about, in his words, 'murdering God'.<sup>34</sup>

Another exposure Darwin had to phrenology was with his friend and colleague Hewett Cottrell Watson (1804–1881) who endorsed evolution as early as 1836.<sup>35</sup> In 1836, Watson published a paper in *The Phrenological Journal* titled 'What is the use of the double brain?' In this paper Watson speculated on the function of the two human cerebral hemispheres. His idea soon achieved scientific status when, encouraged by the French phrenologist/physician Jean-Baptiste Bouillaud, evolutionist Paul Broca published his research on the brain's speech centre, now known as Broca's area.

Watson later turned his energies to the question of evolution. He purchased *The Phrenological Journal*, and appointed himself editor in 1837. In the 1850s, Watson conducted an extensive correspondence with Charles Darwin who mentioned him 10 times in the first edition of his *On The Origin of Species* including two very generous acknowledgements for his scientific assistance. His exact words were "Mr. Watson, to whom I lie under deep obligation for assistance of all kinds",<sup>36</sup> and to "Mr. H.C. Watson to whom I am much indebted for valuable advice and assistance on this subject".<sup>37</sup>

As an undergraduate, Charles Darwin privately sympathized with phrenology. He saw in the process evidence of free will, writing:

"One is tempted to believe phrenologists are right about habitual exercise of the mind altering [the] form of the head, and thus these qualities become hereditary. When a man says I will improve my powers of imagination, & does so,—is not this free will [?—he improves the facility ... an animal improves because its appetites urge it to certain actions which are modified by circumstance."]<sup>38</sup>

This was an important idea in view of the fact that the major issue Darwin was forced to deal with in his evolution theory was not the survival-of-the-fittest, but rather the arrival-of-the-fittest. Phrenology implied, according to Darwin, that desire and will can alter the body, producing physical changes that natural selection can act on. In his M notebook Darwin wrote:

"I believe, in Materialism, say only that emotions, instincts, degrees of talent, which are hereditary, are so because [the] brain of [the] child resembles parent stock.— (& phrenologists state that brain alters [the body])."<sup>39</sup>

In a letter dated January 3, 1830, Charles wrote to his cousin and friend Rev. William Darwin Fox that he "dined with Sir J. Mackintosh & had some talk with him about Phrenology, & he has entirely battered down the very little belief of it that I picked up at Osmaston [the home of the Fox family]". Evidently, some discussion in favour of phrenology, and about which personality factors affected the size of certain bumps on the head of interest to phrenologists, had occurred in the Fox family home. Darwin added one reason for his doubts about phrenology, as Mackintosh expressed: "as long as Education is supposed to have any effect decreasing the power of any organ of the brain, he cannot see how it [phrenology] ever can be proved to be true."<sup>40</sup> In other words, if experience affects phrenology-relevant traits, changing the brain structure, then the readings of the innate brain traits phrenology is designed to interpret will be distorted or may even be invalid. Nonetheless, as we will show, phrenology had a major influence on Darwin's beliefs, and especially his evolution movement.

Darwin, according to the above quotes, appears to accept the basic idea of phrenology that the cerebellum and cerebrum each consist of many different organs in which the person, or the soul in Christian terms, resides. However, phrenology in general accepts that brain organs can change through education, as Darwin noted in his M notebook. Thus, changes in these organs will change the shape of the skull. Consequently, the skull surface traits will produce an accurate reading when the measurements are completed. And if the skull surface traits change, the later reading will produce a different result, reflecting the change due to education. As a result, both readings would be accurate when they were done.

### Phrenology ideas spread beyond Europe

Phrenological teachings soon rapidly spread to much of the Western world. In 1834, Professor Combe lectured in the United States, where phrenology soon became a popular movement. Fowler also began publishing his journal titled

*The Phrenological Journal and Science and Health*, from 1839 to 1911, to spread his ideas.<sup>41</sup> Fowler's journal included a large number of articles written by educated professionals, including many medical doctors and college professors.

The intellectual elite found phrenology especially attractive because it provided a materialistic, evolutionary explanation of mental processes based on direct observation. For example, within a year of the formation of the French phrenology society, of the 150 members, 82 were physicians, both those in private practice and in academia, and 6 were lawyers.<sup>42</sup> Leek claims a long list of highly educated persons have supported phrenology.<sup>43</sup> However, some intellectuals accepted the organology brand of phrenology while at the same time questioning the cranioscopic orientation of phrenology.

By 1838 "phrenological ideas had achieved widespread acceptance throughout the United States".<sup>44</sup> Phrenology lectures attracting thousands gave advice on matters including the best way to hire new employees or find a suitable marriage partner.<sup>45</sup> In the end, phrenology became a part of applied psychology accepted by many intellectuals of the 19<sup>th</sup> and 20<sup>th</sup> centuries.<sup>46</sup>

The popular success of phrenology helped supporters ignore its significant lack of scientific evidence. Its influence on evolution is illustrated by the fact that Alfred Russell Wallace, the co-founder of Darwinian evolution, opined that the "greatest failure of the nineteenth century was its turning away from phrenology," which Martin adds was a "patently wrong idea [that] made a tremendous impact on the nation".<sup>47</sup> Wallace as a young man "became hardened in his naturalistic views by a study of ... phrenology", and even "in his old age he prized the delineations of his cranium done by phrenologists Edward Hicks and James Rumball, the latter having also read Herbert Spencer's head".<sup>48</sup>

Spencer, a major contributor to evolutionary thinking, converted to phrenology as a youth and, although he rejected some of their ideas, remained a believer for much of his life, even writing articles for phrenology journals.<sup>49</sup> The belief that character and intellect were mere materialistic functions subject to deterministic psychology had a profound effect on his ideas and writings, and consequently on society due to his development and promotion of Social Darwinism, one of the most destructive ideas in history.<sup>50</sup>

### Facial angle theory incorporated into phrenology

The study of face and body features, a field called physiognomy, accentuated the "tendency in phrenology to establish a rank order of races and nationalities along a scale of perfection" toward the Caucasian ideal.<sup>51</sup> The influence

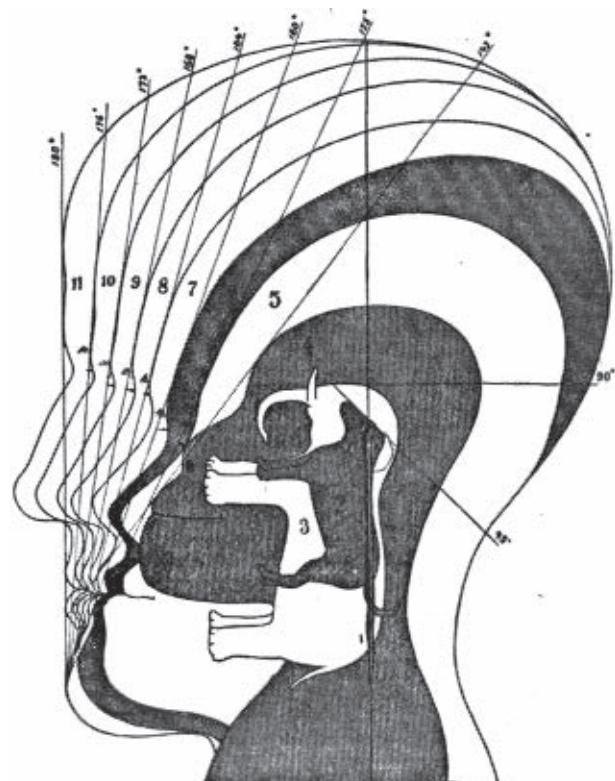


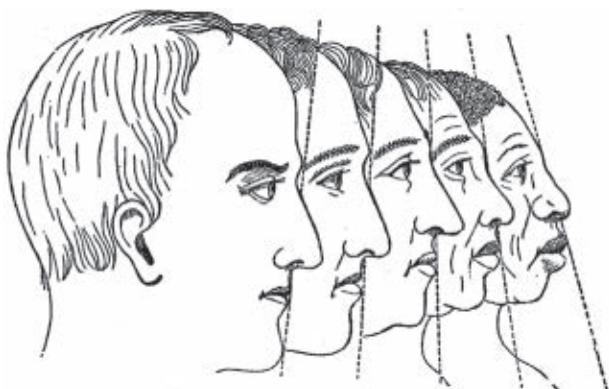
FIG. 1. THE FACIAL ANGLE (BY NELSON SIZER).

**Figure 3.** Illustration of how facial angles were used to show human evolution from mammals as well as for ranking 'races' from the lowest to the highest (from Cranium<sup>52</sup>)

of physiognomy in phrenology resulted in its incorporation into phrenology.<sup>52</sup> Facial angle theory hypothesized that the facial angle reflected not only the trend from fish to humans, but also could be used to rank human racial groups from inferior to superior. An article in *The Phrenological Journal* by an author using the pseudonym 'Cranium' included an illustration commonly found in 19<sup>th</sup>-century literature ranking life from simple to complex, from snakes to humans (figure 3).

Facial angle theory was also used to rank humans from inferior to superior.<sup>53</sup> The *Phrenological Journal* author showed photos of actual heads of a 'civilized' Caucasian and a Negro whom he called a 'savage', adding that Negroes were one of "the lower classes of men" that ever lived (see figure 4).<sup>54</sup> The facial angle theory influenced phrenologists to use it in an attempt to 'predict' intelligence levels. It was noted that even the ancient Greeks and Romans believed a 90° facial line was a sign of a great level

"... of knowledge and reflection, and a corresponding contraction of the mouth, jaws, tongue, nose, indicated a noble and generous nature. Hence they have extended the facial angle to 90° in the



**Figure 4.** Facial angle was used not only to document evolution, but also to rank the races from inferior (the least vertical one) to superior (the more vertical line) (from Jeffries<sup>72</sup>).

representation of legislators, sages, poets, and others, on whom they wished to bestow the most august character. In the statues of their heroes and gods they have still further exaggerated the human, and reduced the animal characteristics; extending the forehead over the face, so as to push the facial line beyond the perpendicular, and to make the angle 100°.<sup>55</sup>

Thus, facial angle was believed by scientists to have effectively quantified, not only the “very striking difference between man and all other animals”, but also the difference between the various people groups.<sup>56</sup> Science historian John Haller concluded that the “facial angle was the most extensively elaborated and artlessly abused criterion for racial somatology” in the late 1800s.<sup>57</sup>

### Phrenology used to justify racism

Scientists and others searching for a scientific basis for racism found phrenology very appealing as a justification for the belief in Western superiority over the evolutionarily inferior races.<sup>58</sup> The phrenologist compared skulls of different ethnic groups to find evidence for ranking races from the least to the most evolved. Dr François J.V. Broussais, a disciple of Gall, proclaimed the Caucasians were the ‘most beautiful’ race while claiming peoples like the Australian Aboriginals and New Zealand Maoris would never become civilized since they lacked the cerebral organ required. Some phrenologists even argued against the emancipation of the slaves on the basis of phrenology. Conversely, other phrenologists argued that even less evolved people could improve through education and interbreeding.<sup>59</sup>

Evolution also influenced phrenologists. One review of *Vestiges*, quoting the original book, included the following passage:

“Our brain goes through the various stages of a fish’s, a reptile’s and a mammifer’s [obsolete term for mammal] brain; and finally becomes human ... after completing the animal transformation, it passes through the characters in which it appears in the Negro, Malay, American [Indians], and Mongolian nations, and finally is Caucasian.”<sup>60</sup>

He added:

“... the various races of mankind, are simply representations of particular stages in the development of the highest or Caucasian type. The negro exhibits permanently the imperfect brain, projecting lower jaw .... The aboriginal American represents the same child nearer birth. The Mongolian is an arrested infant newly born.”<sup>61</sup>

These are yet other examples showing how evolution influenced phrenology even before Darwin. Its influence after Darwin increased significantly. The racism in phrenology was also heavily influenced by evolution as, likewise, phrenology significantly influenced evolution, although often indirectly. A racial hierarchy was not inevitable in the phrenology worldview, but was common, influenced by the fact that many phrenologists concluded that some ‘savage’ races were innately uncivilizable.<sup>62</sup>

In short, phrenology readings in some cases strongly reinforced racial prejudice and commonly rated non-Europeans as stupid, ignorant, cruel, hopeless, and having other very negative traits.<sup>63</sup> The Hottentots were believed to be less evolved than most other races and “were under the complete domination of animal instincts”, and south-east Africans were “at the bottom of the human [evolutionary] chain ... hardly superior to animal instincts ... there was ... more resemblance between the heads of certain Negroes and of great apes than between Negroes and Europeans.”<sup>64</sup> Therefore, instead of allowing bumps to do the talking, racial bias was used to exploit the terrain of heads to support preconceived opinions.

### Gender stereotyping

Gender stereotyping was also common in phrenology. Like racial inferiority, gender inferiority was read from the skull contours of females. For example, women whose occipital region (back of their head) was larger, and who had lower foreheads, were believed to have inferior brain organs for success in the arts, sciences, and intellectual tasks in general, while having larger mental brain organs was related to the better care of children and the acceptance of religion.<sup>65</sup> And, while phrenologists did not deny the existence of talented women, they felt this minority was too

small to provide justification to allow women's participation in politics.<sup>66</sup>

### **Support by doctors, professors, and liberal ministers**

Phrenology was proposed by a number of leading psychiatrists as a viable model to reform both psychology and corrections. It was in this area that phrenology moved from a harmless entertainment to causing harm. Because phrenology was taken seriously in the Victorian era and permeated both literature and novels, it influenced many areas of society. Prominent public figures, even the Rev. Henry Ward Beecher (a college classmate and initial partner of one of America's leading phrenologists, Orson Fowler), actively promoted phrenology as a source of psychological insight.

Italian psychiatrist Biagio Miraglia proposed a new classification of mental illness based on brain functions described by Gall. Miraglia also relied on Gall's phrenological localization of mental functions in the brain to guide him when doing therapy. He even argued that madness was a consequence of cerebral organ dysfunctions that could be detected by phrenology: "The organs of the brain that may become ill in isolation" or in conjunction with other genes and/or structures, and obtain "their activities infected through energy or depression, or inertia or deficiency".<sup>67</sup>

### **Finally phrenology was scientifically disproved**

The first detailed and most complete study of phrenology was by Parker, *et al.*, which

"... sought to test in the most exhaustive way currently possible the fundamental claim of phrenology: that measuring the contour of the head provides a reliable method for inferring mental capacities. We found no evidence for this claim ... a more accurate phrenological bust should be left blank since no regions on the head correlate with any of the faculties that we tested."<sup>68</sup>

### **Conclusions**

The central phrenological notion that measuring the contours of the skull can be used to determine personality traits has now been discredited by empirical research using the scalp as a proxy measure to determine its validity.<sup>1</sup> One problem among many was "its emphasis on the outer head (i.e. skull and scalp) [contours] as an indirect measure of the brain, and thus of personality and behavior".<sup>69</sup> Likewise, external chest traits usually tell us little about the condition of the internal organs, such as the heart or

lungs. Phrenology contributed significantly to the rise of naturalism, materialism, and atheistic worldviews. And, as advanced by men like Gall and Combe, phrenology "became one of the most influential ideological and cultural developments in Victorian Britain" that moved society towards materialism.<sup>70</sup>

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# The chasm between the fish non-pelvis and the tetrapod pelvis

Jerry Bergman

The proposed evolution of the pelvis from ray-finned fish to lobe-finned fish and, lastly, to tetrapod was reviewed, concluding that unbridgeable gaps exist between these three very different pelvis systems. Both the fossil record and attempts to propose evolutionary scenarios were examined. The pelvic differences between apes and humans were also examined, finding several major design differences. This article thus covers the evidence for both the fish-tetrapod and the ape-to-human pelvis transitions.

Fish lack legs and, consequently, do not require the tetrapod pelvis structure existing in many vertebrates. Instead they may have what some evolutionists regard as a proto-pelvis, since they assume that a similar structure in an ancestral fish evolved into a tetrapod pelvis. A true pelvis is a complicated structure consisting of a short bowl-shaped support system connected to a backbone. It is designed to both support the guts and to connect the hind legs to the body midsection. In land animals, this allows the body weight to be supported by the lower limbs<sup>1</sup>

A major problem for evolution is that animals either lack a pelvis structure or have a fully developed one. The functional pelvis exists in two types, the assumed proto-pelvis (or better ‘pelvis analogue’) found in lobe-finned fish, and the tetrapod pelvis. No example of anything in-between these systems is known to exist.

Ray-finned fish, or the class (or subclass) Actinopterygii, have fins which are webs of skin stretched over bony or horny spines (‘rays’).<sup>2</sup> Conversely, lobe-finned fish have fleshy flipper-like fins that, including structures proximal to them, contain bone structures as well as cartilage, joints, and structures that function as tendons. We will examine the evolutionary theory that primitive fish evolved into ray-finned fish, the Actinopterygii, then into lobe-finned fish, the Sarcopterygii, lacking a pelvis, which evolved into amphibians containing the entire pelvic girdle system and four legs. (It would have required another large step to redesign a pelvis that functions for a tetrapod to function satisfactorily for the next step, a biped. The only creatures existing whose dominant locomotive system is fully bipedal are humans.)

## Tetrapod design

Tetrapod and quadruped both mean ‘four footed’, the former from the Greek, the latter from the Latin words for

‘four’ and ‘foot’. But the two words have distinct meanings. A tetrapod is a member of the taxonomic unit *Tetrapoda* (a group presumed to have descended from a specific four-limbed ancestor which walked on land) whereas a quadruped actually uses four limbs for normal locomotion on land. Not all tetrapods are quadrupeds—for example whales are not quadrupeds, as they do not move on four limbs, but are still classed as tetrapods because they are believed to have been descended from ancestors which did. It is the same for ichthyosaurs. Humans, and also birds, are bipeds, not quadrupeds, but are also classed as tetrapods due to their supposed ancestry, as are snakes, for the same reason. And not all quadrupeds are tetrapods—for example the praying mantis is an insect, and so is not presumed to have descended from any four-limb-walking ancestor, let alone the one thought to be shared by all tetrapods. But despite not being a tetrapod, it locomotes on four limbs, so is a quadruped.

The pre-pelvic-girdle connection in fish and ‘early’ tetrapods involves only a fish fin loosely located in the musculature of the ventral body wall.<sup>3</sup> Evolutionists postulate this structure evolved into a complete pelvic girdle that had a “sacroiliac articulation” to the spinal column on one hypothetical unidentified tetrapod.<sup>4</sup> Published drawings of the two structures illustrate the enormous gap between a simple fish fin attachment and a complex tetrapod pelvic girdle.<sup>5</sup>

The problem for evolution is that the entire system, although very different in ray-finned fish, lobe-finned fish, and tetrapod animals, must exist as a complete functional unit in order for it to effectively allow the animal to survive. Because skeletons of lobe-finned fish and all tetrapod pelvis systems are constructed out of bones and accessory structures, they are much better preserved in the fossil record than the soft tissue of ray-finned fish. Consequently, if evolution occurred, the fossil record of pelvic evolution should be well-documented. As we will show, it is not.

### Evolution from lobe-finned fish to tetrapod

The earliest ancestor of tetrapods was proposed to be some kind of *sarcopterygian*, a bony lobe-finned fish and not a ray-finned fish. This conclusion was based on the belief that fewer structural gaps were assumed by evolutionists to exist between a lobe-finned fish girdle and a tetrapod. Cambridge University paleontologist Jennifer Clack wrote that the so-called primitive girdle of one proposed early link between lobe-finned fish and tetrapods (called *Ichthyostega*) appeared advanced beyond its requirements. In her words, “the pelvic girdle appears over engineered for the size of the hindlimb as compared with later tetrapods”.<sup>6</sup>

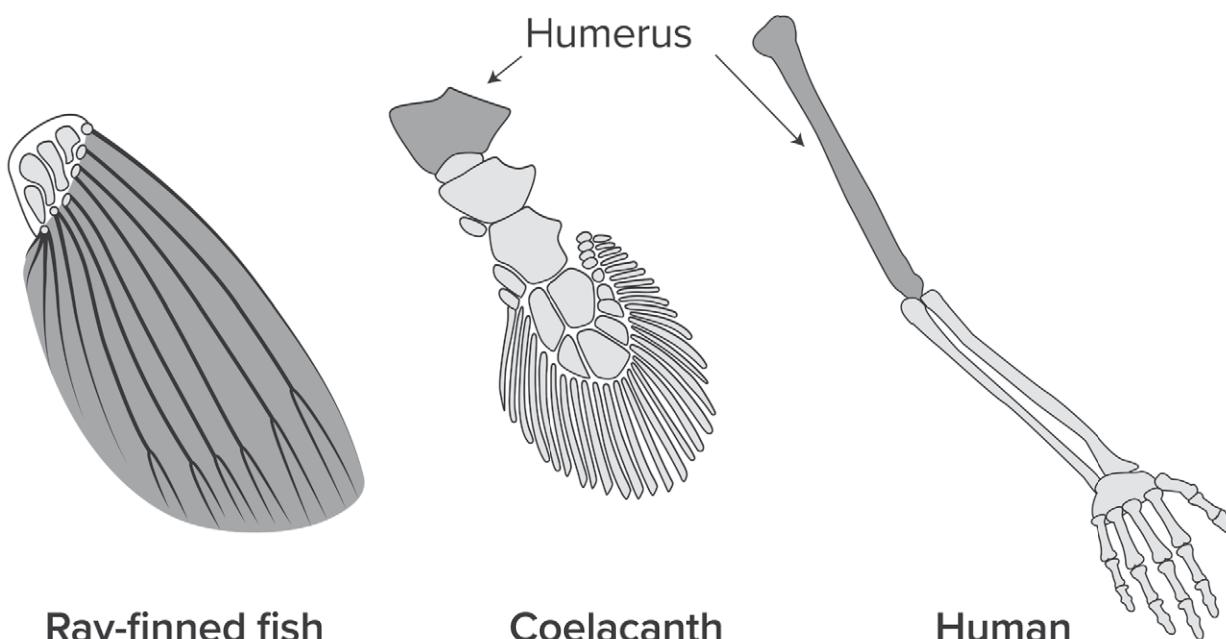
Another fossil postulated by evolutionists beyond *Panderichthys* (a genus of fish, specifically an extinct sarcopterygian estimated by evolutionists to be from the late Devonian period) that contains a fully formed pelvis is *Acanthostega*. *Acanthostega* (meaning ‘spiny roof’) is claimed to be among the first vertebrate animals to have recognizable limbs and was believed by evolutionists to be the first fish capable of travelling on land. Clack notes that the fossil record shows no evidence of any transitional forms between *Panderichthys* and *Acanthostega*. Consequently, she is forced to explain this major gap by concluding its evolution must have occurred so rapidly that the transition did not leave a fossil record. She admits that there is no evidence even of possible “clues to the intermediate forms” between the fish lacking a pelvis and the lobe-finned-fish type of proto-pelvis

structure, and also between the latter and the modern tetrapod pelvis design.<sup>7</sup>

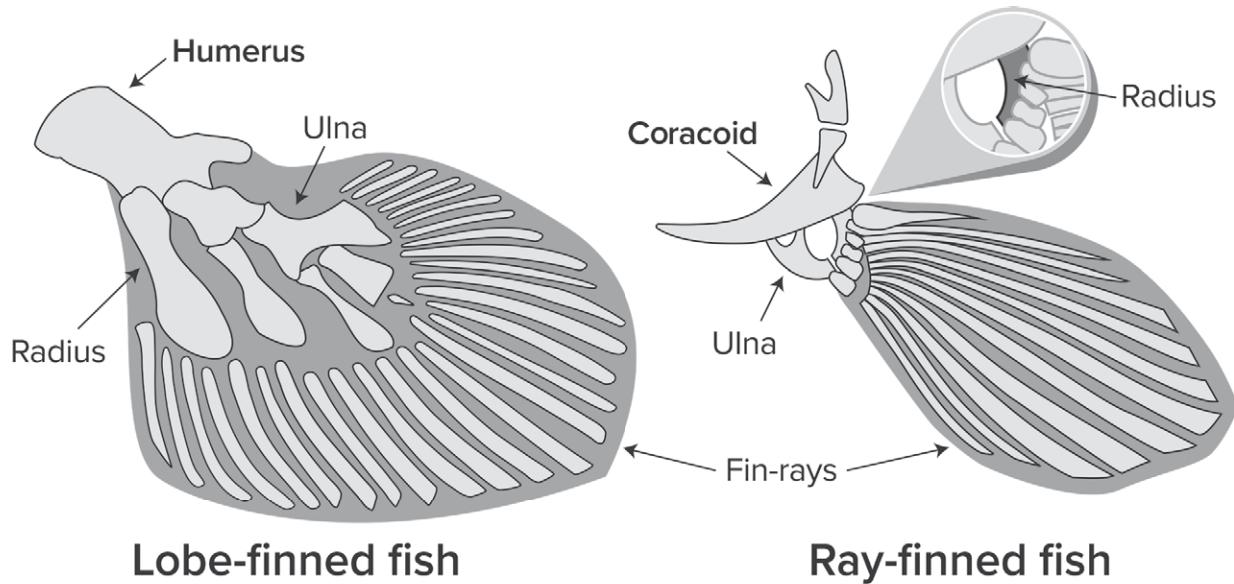
Lobe-finned fish fins are designed very differently from those of all other known fish.<sup>8</sup> They possess paired fleshy fins that generally are designed like most other fish fins except each fin is constructed out of many bones and muscles covered with a fleshy, scaly stalk extending out from the body. This design produces fins that are very flexible, and even useful to crudely support their body on land, such as is exploited by lungfish.

Besides lungfish, the only living members of the Sarcopterygii are coelacanths.<sup>9</sup> The evolution of lobe-finned fish from non-lobe-finned fish is not supported by either living examples or the fossil record. All known extant fish are either non-lobe-finned or lobe-finned, and no examples exist of intermediate forms. To evolve from non-lobe-finned fish to lobe-finned fish requires numerous major design and structural alterations, including the evolution of the humerus, radius, intermedium, preaxial radial, mesomere and ulna, plus several digits and the support ligaments, tendons, nerves, and bone structure,<sup>10</sup> none of which have been documented in the fossil record. Unconstrained by the fossil record, many theories have been postulated to explain this transition.<sup>3</sup>

Wagner and Larsson, after noting the central importance of the transition from fins to limbs in evolution, and the central role of evolution of the pelvis in the transition, was only able to propose three possible theoretical scenarios, all of which are just-so stories, and none of which are based on fossil evidence. Furthermore, the scenarios are contradictory



**Figure 1.** Notice the enormous contrast of the lobe fin (middle) and the human arm (right). The ray-fin humerus (left) has no direct connection with another bone as is true in humans, rather it is connected to coracoid cartilage and is supported only by muscles. The human humerus bone is connected to the body frame, specifically the glenoid fossa of the scapula (shoulder blade).



**Figure 2.** A *lobe-finned fish* design (left) has flippers that contain a bone structure as well as cartilage, joints, and tendons. Conversely, the *ray-finned fish* design (right) has fins composed primarily of cartilage, and has no true bones or skeletal structure. It is connected to a coracoid cartilage structure.

and the authors admit problems exist with most of them, which is one reason why three very different proposals have been postulated.<sup>11</sup> Likewise, the fossil evidence Wagner and Larsson focus on consists of detailed descriptions of various mammals and not discussions of the transition from fish pelvis to mammal pelvis, and then to the human pelvis. If it existed, this exhaustive 435-page detailed review would include it. Instead, the discussions focus on what we should find, but have not found, in the fossil record.<sup>12</sup>

#### From lobe-fin design to tetrapod design

Tetrapod locomotion is also very different to that of fish. Fish glide through water using their fins to control their travel direction, while tetrapods operate four limbs to produce a jerky motion that enables them to traverse land surfaces. Although “sarcopterygian fishes already had internal bones and muscles that produce a form of ‘walking’ … profound modifications had to occur in the lobed fin before it became moderately effective land limbs.”<sup>13</sup> To accomplish the change from a lobe-fin fish design to a quadruped design, Daeschler, Shubin, and Jenkins argue that

“… the proportions of the skull were remodeled, the series of bones connecting the head and shoulder was lost, and the region that was to become the middle ear was modified. At the same time, robust limbs with digits evolved, the shoulder girdle and pelvis were altered, the ribs expanded, and bony connections between vertebrae developed.”<sup>14</sup>

They also note that the “evolution of tetrapods from sarcopterygian fish is one of the major transformations in

the history of life and involved numerous structural and functional innovations, including new modes of locomotion, respiration and hearing”<sup>15</sup>

Note the terminology similarity between human bones and the lobe-fin bones, as shown in figure 1. This does not imply homology as evolutionists assume but is used to help researchers comprehend and work with the enormous variety existing in the natural world. Also note both the similarities and the differences between the ray-finned fish and the more ‘advanced,’ in the evolutionary view, lobe-finned fish (see figure 2). The ray-finned fishes (Actinopterygii) have fins constructed from webs of skin supported by horny spines called ‘rays’, as opposed to the flesh-covered, lobe fins that contain bone structure as well as cartilage, joints, and ‘tendons’ that characterize the class Sarcopterygii (lobe-finned fish).

As shown in figure 2, the actinopterygian fin rays attach directly to the proximal or basal skeletal elements, including the radius, which connect these fins to the internal skeleton. The pectoral fin is located in a part of the skull-jaw structure called the clavicle, the anal ray-fin attaches to the hemal spine. None of these structures even remotely resemble a pelvic girdle in terrestrial animals. The same is true for the lobe-finned fish.

#### The major gap is between the lobe-finned fish and the tetrapods

The pelvis found on all four-legged land animals is a very well-designed complex system consisting of many bones and a cartilage-ligament connection to hold the entire system

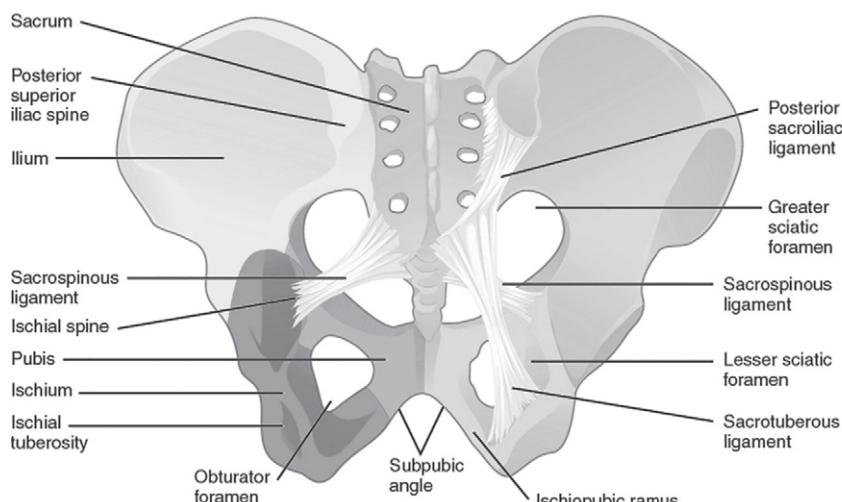
firmly, but flexibly, together. It consists of the pelvic region that includes a pelvic cavity (the space enclosed by the bony pelvis), the pelvic floor, (the area below the pelvic cavity), and the perineum (the space between the anus and scrotum in the male, and between the anus and the vulva in the female) located below the pelvic floor (figures 3 and 4).

The back of the pelvic skeleton consists of the sacrum and below it the coccyx, and anteriorly are two hip bones (each comprised of a pubis, ilium, and ischium). The two hip bones connect the spine with the lower limbs. They are attached to the sacrum posteriorly, connected to each other anteriorly, and joined with the two femurs at the hip joints. The section enclosed by the bony pelvis called the *pelvic cavity* is the section underneath the abdomen containing the reproductive organs and the rectum, while the pelvic floor at the base of the cavity helps to support all of the abdominal organs including the intestines.

Fish are not called tetrapods, but similar evolving-into-terrestrial-animals speculation is the reason Michael Benton called the location where the fish fin is connected to the vertebrae in fish a “*pelvic girdle*”, admitting that the “*pectoral girdle* of most fish is effectively part of the skull”.<sup>16</sup>

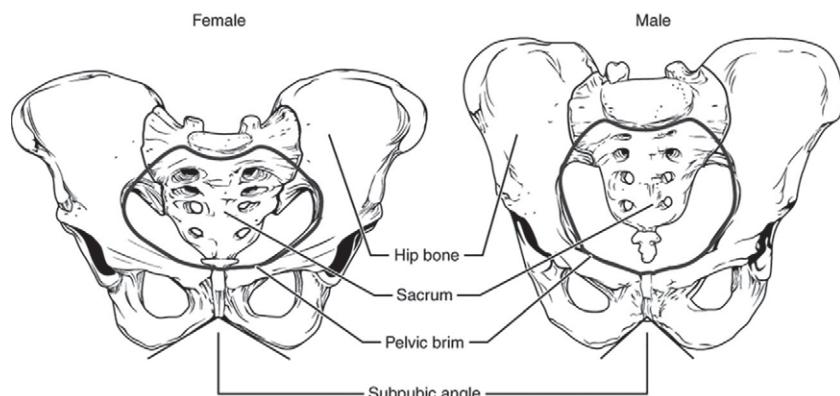
Evolutionists postulate that present-day pelvis morphology was inherited from the pelvis of some primitive quadrupedal ancestor but, as noted, they cannot even postulate a reasonable scenario of the evolution from the non-pelvis fish into a quadrupedal animal.

In spite of millions of mammal and amphibian fossils unearthed in the past 200 years, “the origin of major tetrapod features has remained obscure for lack of fossils that document the sequence of evolutionary changes”.<sup>14</sup> An enormous variety of pelvic girdles have been uncovered during this time, but no evidence exists of the evolution of the pelvic girdle from a fish lacking one.<sup>17</sup> The best the ‘theory’ of evolution is able to achieve is to hypothesize that the pelvic girdle evolved from the lobe-finned fish fin described above!



**Figure 3.** The human pelvis and accessory structures

Image: OpenStax College/CC BY 3.0



**Figure 4.** Some basic differences between the human male and female pelvis

Image: Rice University/CC BY 4.0

### The human and the ape pelvis

The main traits that separate humans from extant apes are brain structures and efficient bipedalism, and a major structure enabling efficient permanent bipedalism is the pelvis. Part of the problem of postulating the evolution of the human pelvis is because it is often “difficult to sort out which species are ancestors and which are [our] cousins, especially because we have so few informative fossils to work with”.<sup>18</sup> Caroline VanSickle says her research focuses “on the evolution of the pelvis, an important part of our evolutionary story because the pelvis of hominins *differs dramatically* from that of the chimpanzee” (emphasis added).<sup>18</sup> The ilium and ischium of apes and humans not only look very different but function very differently in order to accommodate the very different lifestyle of humans and apes. Also, no convincing evidence of clear intermediates exists in the fossil record to support the structural differences.<sup>19</sup>

This conclusion is not due to a shortage of potential examples.<sup>20</sup> The most obvious difference is humans “have a

short ischium on each side of the body to sit on, chimpanzees have long ischia”, but many other pronounced differences exist.<sup>21</sup> Nonetheless, many fossil finds have forced the old theory for the existing pelvis design, due to childbirth constraints, to be seriously questioned, concluding that if “birth constraints do not explain pelvic variation of the past, that must mean we really do not understand why human pelvises look the way they do today”.<sup>22</sup> (See figure 4 for a comparison of the male and female pelvis.)

Paleoanthropologists have spent far too much time attempting to explain the morphological differences via evolution by just-so stories, ignoring other factors that can result in the critical differences observed.<sup>23</sup>

An alternative explanation is that the differences in primate pelvis shapes and designs found in the fossil record have nothing to do with evolution, but rather reflect age, sex, and normal individual variation differences. Research has found that “pelvis shape differs at different ages, even among adults, and to a greater extent in women than men”.<sup>18,24</sup> Furthermore, health and nutritional variations must also be considered, a factor generally ignored and very difficult to determine from fossil bones.

## Summary

A major gap exists between the cartilaginous fish and the bony fish that has not been bridged by the fossil record in spite of extensive searching and the unearthing of many thousands of fossils. One of the major differences existing in apes and humans that use efficient and economical bipedalism as soon as they learn to walk as the, by far, normal and dominant mode of walking is their pelvis design. Major design differences exist in the pelvis in humans and our claimed evolutionary ancestors that have not been bridged by the fossil record … and it appears they never will be.

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